The Far Call

The Phenomenal Success of the Amateur Trans-Atlantic Tests

By Paul F. Godley

ON its editorial page of November 30, 1921, The Star (London), published an article which was intended to inform the public of Great Britain on "the prospects of the new trans-Atlantic wireless tests." The author of this article showed a decided satirical vein and took advantage of a great opportunity to poke fun at American amateur radio phraseology. Further, and "with all due respect," he issued an invitation to America's "'ardest of 'ard boiled 'ams'" to avoid the use of regenerative receivers (when improperly de-

signed and carelessly used they act as miniature transmitters) so that the British amateurs might have a chance of hearing something, too.

These tests were a phenomenal success. The radio world was startled, pleased. Amateurs on both sides of the water are proud of their successful efforts which have been duplicated since. In view of what transpired I am sure that the author of the article mentioned above would now join me in registering amusement at his earlier efforts. But, he performed for me a service. The title of his article was "The Far Call." To me, those words are filled with romance — the romance of strange, fascinating, delightful adventure; a vision of the spirit of youth, vital eagerness, far-darting imagination, and, I ask you, where is there the man who breathes whose intelligence is not held fascinated by speculation upon the limits to which amateur radio signals may be sent?

There are in America 20,000 radio amateurs whose interest in the transmission of small radio signals over greater and greater distances transcends all else. Scattered over the entire land, they continually relay messages from the Atlantic to the Pacific —from Canadian cities to the Mexican border, and, exchange greetings direct between New York, Boston and the Pacific Coast, Montreal and El Paso, Minneapolis and New Orleans; thousands of them, wide awake at 2 a. m., proficient amateur engineers seeking new worlds to conquer. These men held a convention—the First National Convention of the American Radio Relay League—to which delegates were sent from every section on the continent. Here took place organization meetings, technical meetings, inspection of amateur stations in Chicago — the convention city — exchange of ideas, great displays of equipment, but the biggest thing that came out of that convention was the expression of a desire to register American amateur radio signals in Europe and the determination to do it. The co-operation of British amateurs was to be enlisted, and money was appropriated to send a "hard boiled American ham" and American amateur equipment to Europe by way of insurance that it would be done if it were possible. Greatly honored, it was my good fortune to be chosen as that man. This is a story of my adventures.

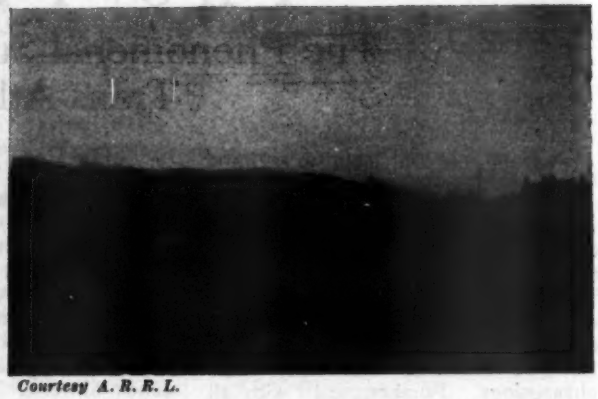
After exchange of telegrams between my home and the convention above referred to, there ensued long consideration of methods and equipment, study of maps and globes and search for information concerning the difficulties to be encountered. Communication was had with our Department of State, and with Mr. P. R. Coursey, Editor of Wireless World (London), who represented the British amateurs. Arrangements were made for a British Post Office permit of operation, and for transportation,

and plans were made for the daily report of results at the receiving end via the high power stations of the Marconi Company (England) and the Radio Corporation of America. Equipment borrowed from our best manufacturers was laid out and set up for a thorough tryout.

On November 1 the preliminary tests, which all were invited to enter, began, and the entrants transmitted on schedule each night up to November 5 in an effort to cover a distance of 1,000 miles overland, failing which they were to be disqualified for participation in the main event. All my equipment was set for action, the super-heterodyne receiver being fed by a three-foot loop antenna. And what interest there was: Seventy-eight star stations scattered through every radio district, worked to schedule with clock-like precision. Station 5ZA in Roswell, New Mexico, consistently pounded in night after night on a four-ohm telegraph sounder by virtue of relays in the circuit. Those were the first thrills.

Then came the night of November 14 with a farewell dinner and with all arrangements completed I sailed for England. Twenty-five contestants had qualified—two more were added later. The ten test nights—December 7 to 16, inclusive—had been divided into two periods, 7 P. M. to 9.30 P. M. Eastern Standard Time, and 9.30 P. M. to 1.00 a. m. The first half of the night was intended as a free-for-all and was divided up into 15-

Courtesy A. R. R. L.
Apparatus in tent at Ardrossan. Note the lantern (upper left) the heating plant consisting of a small oil stove (bottom center) and the thermos bottle (lower right)



Courtesy A. R. R. L.
Location of tent and a view of one end of the antenna which was 1300 feet long

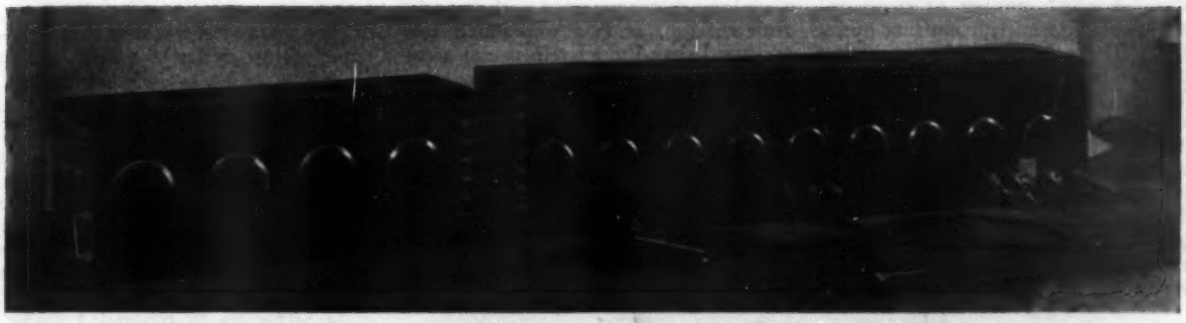
minute periods, one period being assigned to each of the nine American inspection districts and one to the Canadian stations. These periods were rotated each night, so that if there was a better chance at one hour than another all districts would have a shot at it. The second half of the night, from 9.30 P. M. until 1 A. M., was assigned to those individual stations which had qualified in the preliminaries. The time was divided into fourteen periods of 15 minutes each, and during each of these periods only individual stations were to transmit. Two stations were assigned to most periods, although some periods found three stations transmitting, care being taken that the stations were well separated, and their wavelengths about the same to obviate too much adjustment on the receiving end. A secret code word of five letters was assigned to each of the stations which had qualified, with instructions not to open the letter containing the code word until the first night of transmission. A copy of these code letters was handed to me in a sealed package for delivery to Mr. P. R. Coursey in England, who was to be referee throughout the tests, and to whom I was to make all reports of reception in the same manner as did the British amateurs, although, in case of my reports, Coursey was to send them off to the States via the Marconi Station MUU, Carnarvon, Wales, from which station they were to be slowly broadcasted so that American amateurs might hear, after which the Radio Corporation station WII at New Brunswick, N. J., was to slowly repeat them for the benefit of those amateurs having less sensitive receivers.

It was quite apparent that both amateur and professional interest in this great sporting event was running high. The great commercial trans-Atlantic stations were placed at our disposal each morning during the period of the tests through the efforts of Mr. W. A. Winterbottom, Traffic Manager of the Radio Corporation of America. At least a dozen engineers had come forward with offers of assistance. Both Mr. Winterbottom and Mr. E. E. Bucher had given me letters of introduction to the principals of the Marconi Wireless Telegraph Co., Ltd., in England, and had written these men outlining the project and soliciting their assistance. The Radio Corporation had also loaned equipment in the shape of UV-200 detector tubes. Baldwin phones were also included and later proved their worth. Burgess batteries, a General Radio Precision wavemeter, A-P amplifier tubes, and Paragon receiving tuners and amplifiers were all within the trunks on the dock on the night of November 14, at which time a group of prominent amateurs were welcoming me to a very enjoyable informal dinner at the Engineers' Club, New York City, in order that they might offer every encouragement and bid me God-speed.

I shall never forget that night. There were present Messrs. Maxim, Warner, Schnell, Hebert, Camp, Stewart, Service and Goette, all officers and members of the Board of Direction of the American Radio Relay League; Mr. J. Andrew White, Editor of THE WIRELESS AGE; Edwin H. Armstrong, G. H. Burghard, President of Radio Club of America; P. H. Boucheron, Director of Publicity, Radio Corporation of America, and W. S. Smith of the Hartford (Conn.) Courant. This affair was a regular old-time get-together and I was having a great time until someone started on a line of talk which ended up with Armstrong's telling the bunch that he would stake his professional reputation on my success, and with White's assurances to all assembled that there was nothing to it—it was a cinch. I wasn't so all-fired sure about it, and I began having visions of coming back to the States to find a nice little hole to crawl into and pulling it in after me.

At noon on the following day the "Aquitania" slid down the North River and I was off. Prior to sailing, the vessel and the dock had been swarmed by a group of very earnest amateurs who had come to bid me farewell. After these men were put ashore we had great fun signaling back

A view of the special regenerative receiver hooked up with a detector and two-step amplifier



Front view showing the control dials of the super-heterodyne tuner and amplifier

and forth through the din and confusion, and it was in this way that I learned that H. H. Beverage, receiving engineer for the Radio Corporation, was aboard, and I met him for the first time as he leaned over the rail and the "gang" on the dock looked on.

During the voyage across, what time was not spent sleeping, found me either talking to Beverage or in the radio room, which had been thrown open to me as a result of the courtesy of Mr. H. H. Short, Superintendent Marconi International Marine Communication Co., Ltd. It was impossible to do a great deal of listening on the short wavelengths on account of the large amount of radio traffic handled by the bigger vessels, so I had to be satisfied with occasional snatches of 200-meter stuff and the many radiograms which came in via the commercial stations wishing me bon voyage and all success. Those radiograms certainly put it up to me to make good. One from the editor of this magazine read: "Just an added slap on the back, old man, to emphasize my sincerest wish that this trip of yours will go down in radio history," while one from the officers of the American Radio Relay League read: "Bon Voyage: The entire radio world is pulling for you." This was to be no lark! It would never do for me to disappoint that enthusiastic crew of radio men back there. There was only one course open to me — that was the course which, beyond all peradventure of a doubt, would bring in signals, and I began to retrace plans, to amend here and add there.

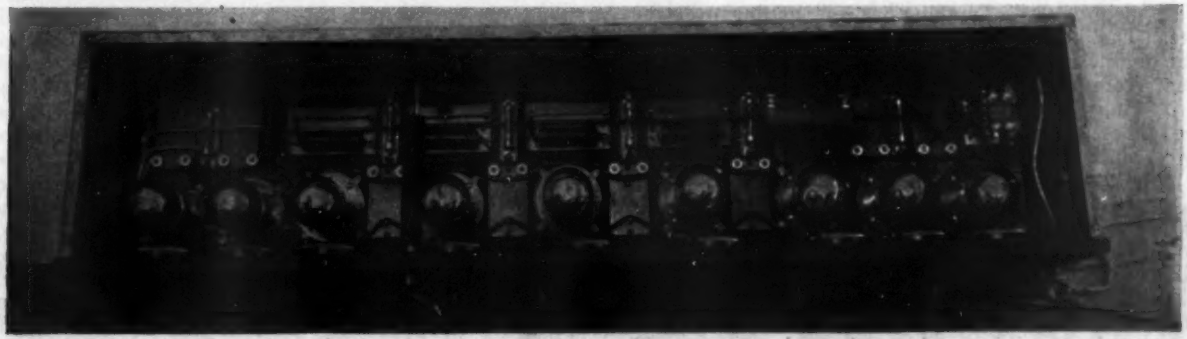
Even European amateurs were all wound up on this thing, too. In reply to a radiogram of greeting to a prominent French amateur came: "Wish you complete success," and when I reached the dock in Southampton I found there waiting to assist me through the customs, Mr. H. J. Tattersall, Superintendent of the Marconi Company in Southampton. The same interest was shown in London when I arrived. I was introduced to all the prominent radio men thereabouts before forty-eight hours had elapsed; had spoken briefly before the Wireless Society of London; had had a mixed debate with regard to the amateur policy of the British Post Office; had listened to an extremely interesting lecture given by Dr. J. A. Fleming before the Royal Society of Arts, and had chatted with such men as Senatore Marconi, Admiral Sir Henry Jackson, President-elect of the Wireless Society of London; Mr. Campbell-Swinton, past president of the society; Prof. E. W. O. Howe, Mr. E. K. Shaughnessy, Chief Engineer, Wireless Section of the British Post Office; Mr. F. Hope-Jones, Chairman of the Wireless Society of London, and many others.

It was at the close of Dr. Fleming's lecture that I met Senatore Gugielmo Marconi. I was greatly pleased at the interest which he showed in the tests which were about to be carried out. He asked many questions concerning my plans and concerning amateur and broadcasting progress in the U. S. A. He expressed every hope that the tests would be successful, and said he saw no reason why they should not be. As I was about to leave him, he asked that I carry back to the amateurs in the United States his good wishes, because, as he said: "You know, I too, am but an amateur."

After this conversation with Senatore Marconi, I was entertained at a little informal dinner in a brilliantly lighted restaurant on the Strand, and everyone present, including two ladies who were qualified as amateurs, toasted the success of the amateur trans-Atlantic tests.

Notwithstanding the wonderful hospitality, I am quite sure there wasn't one of them who thought that we had a chance of putting the thing over. I am also sure that many of them had great difficulty in figuring out how any group of men could take so keen an interest in such a thing as this — an interest which would lead them to spend good time and good money in an effort to carry through such experiments. But they were good sports, because they did their share in every possible way, and if they did finally come to the conclusion that there were possibilities of success, I believe that it was due, in large measure, to the great efforts which they saw had been made by all concerned on this side. And I think they surprised themselves a bit, too, when British amateurs copied at least nine American stations.

There are, in Great Britain, approximately, 5,000 amateurs interested in



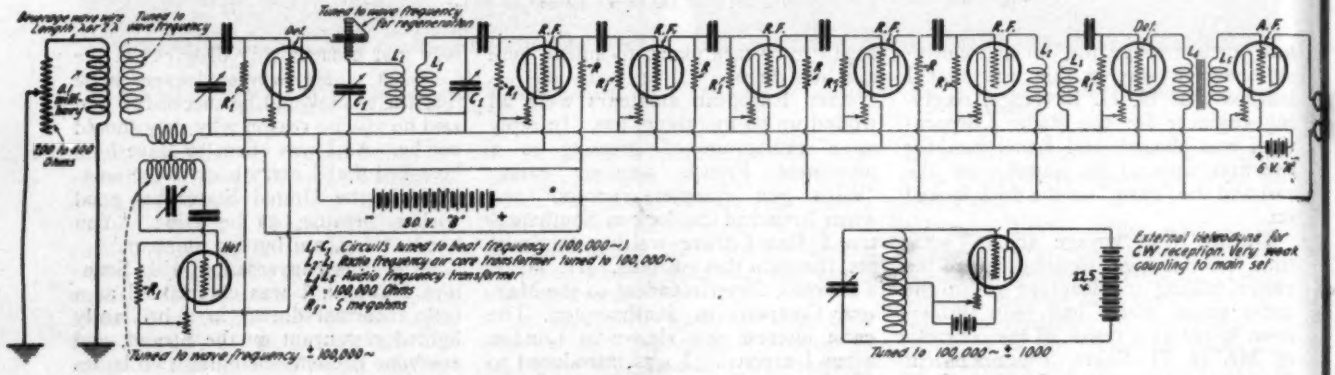
Interior view of the super-heterodyne tuner and amplifier showing the arrangement and construction of the apparatus that make up the set

radio. A great number of these operate receiving and transmitting apparatus. There is, however, no relay work going on. The British Post Office regulations prohibit it. The Post Office officials hold that to permit it would cause a decrease in the revenues which accrue from the telegraphs. The attitude of the general public in Great Britain and the misconceptions under which they are laboring, is very well illustrated by a lengthy editorial which appeared in

very long distances even with "spark" transmission, and is not much less powerful than the gear in use at some of our coastal stations. If amateurs in this country were allowed to use power up to a kilowatt, the whole position of British commercial wireless would be greatly compromised and a good deal of the apparatus and machinery which the Post Office has, under considerable financial restrictions, installed since the Armistice would probably have to be scrapped in order

interfering with "SOS" calls. I wish to go back and straighten these newspaper editors out on the thing. They're all wrong as we well know, and in a year or two they will know it, too, but under the circumstances, the British amateur has a stiff climb ahead of him.

Among those who were first to greet me in London was P. R. Coursey, Editor of the "Wireless World," and Commander Frank Phillips, Radio Engineer and prominent in amateur cir-


Tuned to wave frequency
Tuned to wave frequency for regeneration
Det.
R.F.
A.F.
150 to 400 Ohms
Hot
80 V. "B"
6 V. "A"
L1-C1 Circuits tuned to beat frequency (100,000~)
L2-L3 Radio frequency air core transformer tuned to 100,000~
L4-L5 Audio frequency transformer
R = 100,000 Ohms
R1 = 5 megohms
Tuned to wave frequency ± 100,000~
External heterodyne for CW reception. Very weak coupling to main set
Tuned to 100,000~ ± 1000

The super-heterodyne circuit diagram and some values used in the set at Ardrossan

the Glasgow Herald on the morning of the day when I sailed for home. In part, it reads:

"The position of the wireless amateur in this country has been sharply accentuated by the visit of Mr. Godley, the representative of the American amateurs, who has been carrying out trans-Atlantic low-power wireless tests at Ardrossan. Mr. Godley came over here with a specially sensitive receiving instrument which it was anticipated might record even messages transmitted from American private stations, the power of which is restricted to one kilowatt. The anticipation was realized, messages having been duly taken in from over 30 different amateur stations in the United States and Canada. This is a very remarkable achievement, which certainly does, in a way, open up a very alluring prospect of regular wireless intercommunication between British and American amateurs. But a great many changes will have to take place before the prospect is anything but remote. The position of the wireless amateur in America is altogether different from that of his British confrere. He is, for example, just a hundred times better off in regard to power, since our Post Office at present only grants licenses to use power up to ten watts, and ordinarily the use of an amateur transmitting station "on this side" is restricted to a radius of ten miles. The one kilowatt set, with which American amateurs are privileged to work, is capable, under every-day conditions, of covering

to provide gear capable of effectually dominating amateur "interference."

"America, no doubt, knows her own business best in regard to wireless. It is undoubtedly an interesting, and possibly beneficial circumstance that American amateurs can freely communicate with one another, and listen to concerts and speeches delivered perhaps some hundreds of miles away. But what is good for America is not necessarily good for us, and we must not blame our Post Office if it exercises very great caution indeed, in following the American Government's example in extending amateur wireless facilities. The post master general in this connection acts as trustee for the public and his responsibility is threefold. First, he must see to it that the efficiency of his own wireless service is not in any way compromised by amateur interference; secondly, he has to consider the case of the various ship and commercial stations to which he grants licenses; thirdly, there is no getting over the fact that wireless is at present a valuable government monopoly, which, in the near future, will probably be developed to a very high pitch of revenue earning capacity. As a nation we can ill afford the marked depreciation of the income to be derived from telegraphy, both with and without wires, which will inevitably ensue if British wireless amateurs obtain all the facilities enjoyed by the same class in America without official let or hindrance."

They think a great deal more than they say, too. They even accuse us of

cles. Coursey had already arranged for a permit for operation, and this permit restricted me to the home station of Mr. Phillips. As soon as I could get my bearings, all equipment was taken to Mr. Phillips' home, set up, and put into operation.

We American amateurs have seen and read a great deal that has been written in the British Radio magazines concerning those obnoxious ones who insist on allowing their regenerative receivers to oscillate. Until I had listened in near London on some of the 10-watt radiophone "concerts" I never before fully appreciated the meaning of the phrase "radio concerts." Then I knew. A radio concert near London is a concert of listeners, all listening to the same 10-watt radiophone about 40 miles away, and all allowing their receivers to operate on or near the zero beat. That is, their receivers were oscillating, and what one heard instead of the phone was about fifteen or twenty faint flute-like notes, each of a different pitch. It is needless to point out that this entirely spoiled, in most cases, the speech or the music, and this was usually true during the musical programs sent out by a Dutch Radio Company at the Hague on Sunday afternoons. We, here in America, are beginning to get that, too, particularly those of us who live in the congested areas, and I have been speculating for many months on how far those types of receivers which do radiate considerable amounts of energy when allowed to oscillate will offset the value of the radiophone con-

certs in these congested districts remote from the source of the concert, and how soon it will be found necessary (if we are to get the most out of the broadcasting programs), for steps to be taken to put a stop to the thing.

During my entire first visit to London, the fog was so thick that it could be cut with a knife. You, no doubt, have heard of the "pea-soup" fogs. They originate in London, and I was forcibly fed on one for about 10 days. And that reminds me of a conversation which I listened in on while at Wembly Park, which took place between the operator at the Croyden air-dome and one of the London-to-Paris planes. The plane was in-bound. The fog was thick. The pilot's name was Robinson, and he was very keen on landing at Croyden notwithstanding that orders had been passed out to him earlier to land at a point some 25 miles south of London. The conversation ran something like this:

"'Allo R-r-r-r-robbie; Cr-r-r-royden callin'; 'Allo R-r-r-r-robbie; Cr-r-r-royden callin' and s-v-itchin' over."

"'Allo Cr-r-r-royden; 'allo Cr-r-r-royden; I expect to land at Cr-r-r-royden; R-r-r-robbie s-v-itchin' off."

"'Allo R-r-r-robbie; 'allo R-r-r-robbie; Cr-r-royden here; you are positively forbidden to land at Cr-r-royden; you are positively forbidden to land at Cr-r-r-royden; Cr-r-r-royden s-v-itchin' off."

Apparently Robbie was a daredevil. He did land at Croyden.

After a little of this radiophone stuff and listening in on various wavelengths to all the strange commercial station calls up and down the European shores, we settled down onto 200 meters to see what it was like. And what do you suppose we found. Static! Gobs, and gobs of it. And harmonics, whole orchestras of them! Home was never like this. One could read nearly all the high-power stations in Europe on or near two hundred meters. There was POZ, Nauen; FL, Eiffle Tower, Paris, MPD, Poldhu, England;—all the high-power stations in Christendom whistling and bubbling and wheezing away. Through five nights of this we sat and listened—or rather Phillips sat, and I stood and listened and shivered, with a gas fire going full tilt in the fire place, and never a peep from the U. S. A. Phillips took quite a fancy to the receivers, but carried a knowing smile which meant to me "Well, old top, you'll learn something about what we were up against during the last tests."

Courtesy A. R. R. L.
A perspective view of the extensive antenna and surrounding flat country

I must confess, frankly, that I wasn't at that time very much in love with the job ahead of me. I was worried — and deucedly cold besides, and the only way I could jolly myself along was to paint mental pictures of a beautiful flat of land by the sea on the Scottish coast in one corner of which stood a cozy little cottage all nice and warm inside; a long table in one room which faced the West; and a beautiful view, through the window, of the sea-side flat across which stretched a business-like Beverage Antenna. And, I carried this picture around with me until, finally, there was nothing left for me to do but go and look for the original. Anything was better than being forced to live through the days and nights with a feeling that it would be the same old story of static and harmonics, harmonics and static, over and over again. And, too, I had a feeling that if worst came to worst, rather than face the London crowd again, I could jump right off the Scottish shore and swim back, land in Newark bay, and slink across the Jersey meadows in the dark of the night.

On the other hand, I disliked to run away from Coursey, Phillips et al. In their place, I think I would have been somewhat disappointed. We had planned that various amateurs in the London area would sit in with me during the several nights, and I'm sure I missed a great deal. But signals were the thing, and all manner of fellowship could never, never make up for the lack of them.

Interior view of the detector and two-step amplifier showing the UV-200 and 201 Radiotron tubes

After negotiations, which required some effort with the British Post Office, regarding an alteration of the operating permit to cover some location within a radius of 40 miles of Glasgow, it was granted. It is likely that the hesitation shown was due to the unwillingness on the part of Post Office officials to weaken their position with regard to amateurs. Any favors shown me would most certainly encourage British amateurs to ask greater leeway. Any success which I might have would most certainly encourage British amateurs to present a bolder front than at any time in the past. But, knowing this, and thinking as they do that amateurs should have no place under the sun, still permits were granted. If a certain honorable gentleman, Mr. J. W. Wissenden by name, and who is by occupation assistant secretary to the Post Master General, ever puts in an appearance in the States, and I learn of it, I shall see to it that he gets a permit to do anything he wishes, Antis notwithstanding.

Before leaving for Scotland conferences were held with Coursey, which covered methods of reports to him and his dispatch of them via MUU. This brought us in touch with Mr. Otto Rochs, Traffic Manager, Marconi's

Wireless Tel. Co., Ltd., who held that there was nothing connected with his service too good for amateurs, and his performance was entirely in accord with his views. There were others working for us, too. Arrangements were made from London with the Marconi Co. for the use of materials, men and the company's motor truck in Glasgow if this were needed. This assistance was not solicited and came as a result of the keen interest taken in the whole scheme by Mr. W. W. Bradfield and Mr. Allen, joint general managers of Marconi's Wireless Tel. Co. About this time I also met Mr. H. J. Round, Marconi Receiving Engineer, whose contributions to the art are familiar to all amateurs. He, too, was keenly interested not only in the trans-Atlantic tests, but in everything that we are doing on this side, and I took advantage of him to the extent of learning all I could from him.

The night of December 1 found me aboard train and off for Aberdeen on a little side trip which it was hoped would bring to light first-hand information concerning the reported reception at that point of station 2QR. For the first time since reaching England I was cozy and comfortably tucked away in the berth of a first-class sleeper on a through express. The compartment was steam heated, and things were so arranged that one could lie in bed and turn steam on or off (I left it on), open or close ventilators, start an electric fan, ring for porter or take a drink, and in the morning a tray containing tea and biscuits was brought in. Home was never like that either. And, what a sad contrast between the comforts on this train and what was to come!

After spending a little time in Aberdeen, which, by the way, is the most beautiful city I ever hope to see, I booked passage to Glasgow, where I arrived Saturday evening, December 3. I greatly missed the berth in the first-class express and made great haste to get into flannels and between the covers in a heatless room, while on the following morning I toured the hotel in search of a fire and found one — just one — which was in an open grate in the lounge room. To this I stuck as closely as possible until Monday morning.

Information gathered in Glasgow concerning the layout in the coastal towns and Ardrossan in particular completely dispelled the cozy cottage part of my idealistic picture. There was no way out of it, so arrangements were quickly made for shipment of a 12 by 18-foot tent by express train, while through the efforts of Messrs. Carswell and Sutherland of the Marconi Marine Communication Company wire, insulators, storage cells, etc., were lined up and started on their way. Arrangements were also made to secure the services of the checking operator, Mr. D. E. Pearson, Chief Inspector of this company in the Glasgow district. Both Carswell and Sutherland took great interest in the little game I was to play, and without their assistance I might well have had a different tale to tell. Carswell lined me up with the town clerk in Ardrossan, a Mr. Wood, who was a personal friend of his, while Wood, together with Carswell who joined me in Ardrossan on the following day, saw to it that I got started properly with the city officials who vise-ed my credentials. Both Carswell and Wood spent the greater part of the day in helping me locate the station site. Pearson joined us after lunch, and trunks, tenting, and various other material having arrived on schedule, construction of the station began by mid-afternoon on Tuesday the 6th, with prospects of having it in operation by midnight. The weather, however, was all of the wrong sort. The selection of the site, the transportation of the material to the site, and the erection of tent and antenna were all accomplished amid a downpour of rain. By the time the tent went into position darkness had fallen, and the tent had not been in position many minutes ere a great gust of wind had flattened it and also our spirits. The weather and the darkness finally beat us, forcing an abandonment of the work until the following day. Two hours and twenty minutes of listening in that night — the first of the tests — was effected by using a Western Electric "peanut" tube supplied by Burgess batteries both on the plate and filament. Nothing was heard but static and ship stations, though we listened in on shorter wavelengths.

On Wednesday the 7th, the 1300-foot stretch of line was completed, the wire being supported by 2 x 4 inch posts 12 feet high, and laid out to point directly toward Chicago. The wire was grounded at the distant end through a non-inductive resistance (250 to 400 ohms) and at the home end through a variable inductance of the order of 0.1MH in value. This constitutes the Beverage antenna. For any given wavelength the wire should be one, or two even wavelengths long. Arrangements were made to change the length of the wire, it being necessary in each case to shift the non-inductive resistance and ground connection from one supporting pole to another. Signal potentials built up in such a wire are approximately equivalent to those which would be built up in a vertical wire one-tenth (at most) of its total length. When working at 200 meters and having a wire length of approximately 650 feet (one wavelength), signal potentials produced in the wire would be equivalent to those produced in a vertical wire 65 feet in height, or, if the full wire were used, 130 feet in height, at that wavelength. Furthermore, the system is highly directional, and eliminates a great portion of the atmospherics and interference coming from directions other than those from which one wishes to receive. That this condition did exist was proven frequently by comparison with a small vertical wire supported by a nearby tree. Static to signal ratio in all cases was decidedly better on the Beverage wire.

Within the tent the regenerative receiver and super-heterodyne receiver were set up together with all accessories which were found to be in first-class condition. Circuit diagrams and photographs of this equipment accompany this article. Reference to the regenerative receiver circuit is unnecessary inasmuch as it is familiar to the great majority of all amateurs, while the circuit diagram of the super-heterodyne is self-explanatory insofar as constants of the circuit are concerned. For a discussion of the action of the super-heterodyne receiver the reader is referred to previous articles by the writer which have been published in THE WIRELESS AGE.

At 11.30 P. M. all outside work had been completed and equipment arranged inside, whereupon the apparatus was gone over and put into operation. First the radio-frequency amplifier used with the super-heterodyne receiver was started up and time signals heard, without antenna, from both FL, Eiffle Tower, Paris, and POZ, Nauen, Germany. Next, the tuning equipment, which formed the super-heterodyne, was gone over in connection with a short wire which had been thrown into a nearby tree, and all circuits were adjusted while working on the multiude of 600 meter signals which were coming through. VCE, Cape Race, was there, and most as strong as any of them, and I took this as a good omen. Finally, the Beverage wire was thrown in, preliminary adjustments made at both ends of the wire, and tuning started, the first signals recorded being the host of harmonics from the high-power stations, although these were not as bothersome as was the case near London. Search for short-wave amateur signals began at 1 A. M.

Exactly 33 minutes later the universe cracked wide open! In one magic moment Scotland's erstwhile gloomy shores became a haven of rest! Muscle soreness, soul sourness, fatigue and doubt vanished, and my unexpectedly difficult but insistent duty became a joy forever! Cold rains then were as liquid sunshine: boisterous, cutting winds as balmy, heaven-sent

breezes. Nothing in the whole sad world could possibly be wrong — nothing, for an American amateur signal was piling in on us and rising in strength until at 1.42, in a very positive manner, his 60-cycle synchronous spark spelled out a message to someone that he would "see him later" and plastered the call letters 1AAW where the whole world might read!

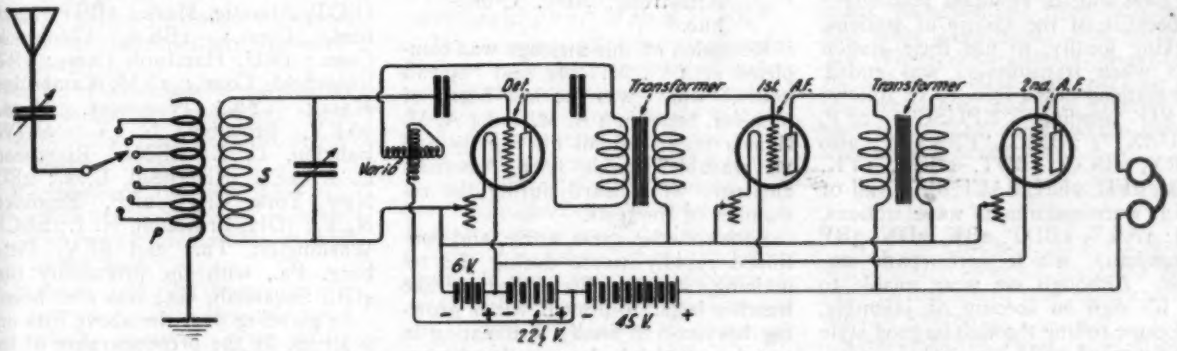
Perhaps it was well that something happened shortly which allowed the charges to "leak off our grids." I had great difficulty in retaining composure. The lid was due to come off! After "camping" on this fellow's wavelength he came in again at 1.50, but was too weak at that time to be read through the heavy static, and having heard no more of him up to 2.35, I began to smell a rat, ran down to look over the line, and returned in a few minutes to report a pole broken off short, a couple of others badly out of line and the wire on the ground at a point about 700 feet from the tent. We shut down, grabbed pick and shovel, and mushed out into the tempest to repair the damage. Thirty-five minutes later we had shaken off as much of the slime as possible and were back on the job. Atmospherics were coming heavier, and nothing more was heard of amateur signals, although Cape Race was buzzing merrily away as we shut down at 6 A. M. But, I had no complaints. Twenty-one consecutive hours' work, no matter what the conditions, or when, or where, can ever again bring to me the supreme satisfaction that came then.

The strange, and, I should say, even sad sequel to this wonderful good fortune runs as follows: Due to error in the use of codes between Coursey and myself, station 1AAW was broadcasted to the U. S. A. as being 1AAY. This was not straightened out until 48 hours had elapsed, and, after being straightened out, it was found impossible to locate the sender. Station 1AAW in Roxbury, Mass., had not been in operation for some time, although investigation on the part of the officers of the American Radio Relay League brings to light the information that someone in the Boston district has been using that call. Whoever he is, I hope that sometime he may find courage enough to come forward and admit it. It's a serious offense to appropriate a call and operate in violation of the law, but I would like to shake that fellow by the hand, regardless.

After a good long sleep which was split up, due to the necessity of properly repairing the line during the afternoon of the 8th of December, we got out to find the heavens filled with stars and a bright moon shining. There had been high south-westerly winds during the day with plenty of rain, but now the wind had shifted to the north-west. After two or three hours of listening without further result, we were forced, due to the cold, to make a shift in the arrangement of the equipment in order that we might take full advantage of the heat which our tiny oil stove threw out. Fortunately there was enough canvas left over from putting the tent together to make it possible for us to get a long strip of canvas at our backs, thus pretty well shutting us into one corner of the tent. At this time we also rigged up our lantern so that greater advantage might be taken of its poor light. Subsequent to the changes another two and a half hours of listening brought continued lack of results, and it was necessary to report "no signals."

On the night of December 9 the weather had again gone very wet, and the winds had grown considerably heavier. Atmospherics were also heavier than the night before, being of about the same order as on the night when 1AAW was heard. At 12.50 A. M. on the morning of the 10th, after listening for sparks, we switched over for continuous wave reception and immediately picked up station 1BCG on 230 meters. We had some difficulty with him due to atmospherics and a very bothersome harmonic from the station at Clifden, Ireland, 150 miles away. Both these were nullified to a great extent by various adjustments of both the apparatus and the line wire. During the adjustments we lost 1BCG several times. These adjustments were terminated at 1.33 A. M. and we began logging him. He called "PF" several times, his sending being very steady, but fading out for 30 seconds every three or four minutes. At 1.59 A. M. he called station 2BGM, said "Phone us now" and shut off.

This was the real stuff! No funny business here at all, and for a second time I ran the gauntlet of a whole colony of real thrills. Some radio history was being written in that miserable tent. Oh! how I wished for a transmitter, with which to make more of it!



Circuit diagram of the special regenerative receiver and detector with two steps of amplification

Nothing further was heard of 1BCG this night. We shut down at 6 A. M. and talked it over. Signals had been so steady and so seemingly dependable that both Pearson and I wondered what power he might be using. Pearson was quite sure it must be several kilowatts, and I couldn't say no. Subsequently we learned that the input was 900 watts.

At 7 A. M. we, for the first time, listened in on MUU as he sent "Godley's message" through. That was indeed a pleasurable 10 minutes, for as I listened I pictured the thousands of eager listeners on "the other side" to whom these radioed reports would bring increased enthusiasm for this most wonderful game.

Failure to hear stations other than 1BCG on this night coupled with the great strength and steadiness of his signals brought about a lot of speculation on my part as to whether he was to be the only reliable signal to get through to us, and I concluded that he might very well be, so, I cabled him: "Send messages." This cablegram was horribly mutilated enroute. It reached Armstrong reading "Send mges." He took this to be some sort of a code word which I wished him to transmit in order that the British amateurs might be convinced that I didn't have a transmitter hidden somewhere on my person, and feeling

that they should be shown he transmitted "MGES," and did it the whole night— or rather morning of the 11th.

His action, however, enabled further adjustments on the Beverage wire, which, taken with the conditions which prevailed, made of the expedition a *real* success, for on this night 18 different stations were logged, the secret code words being gotten from three of them, while dozens more were heard but not logged, either due to our inability to make out their weak signals through static—because of the number of stations working at one time and the resultant jamming—or because of the failure of stations, working locally, to use their station calls when transmission was ended. The stations heard Dec. 10-11 follow:

1RU sending "BPUSC"; 2FP, "HUZXJ"; 2BML, "FSXVG"; also 1ARY, 1BCG, 1BDT, 1BGF, 1YK, 1XM, 2FD, 2EH, 8ACF, 8XV, all of which were continuous wave stations, and: 1ARY, 1BDT, 2BK, 2DN, 3BP (Canadian), which were spark stations. Although we were unable to get his sign on account of jamming, 9ZJ came rolling through in good style as he worked 2EH.

The most remarkable feature was the strength of some of these signals. 1BCG's signals could have been heard easily 400 feet from the tent. Although we started out to see how far away he could be heard, we gave the idea up because of the rain which was coming down, and because of the time which would have been taken. 1ARY and 2FD (and later 2FP) almost equalled 1BCG as to strength, during one or two very short intervals. 1BDT, a spark station, although by no means as strong, almost equalled 1BCG in steadiness of signals during a long period. Two of the continuous wave stations were using powers of less than 30 watts!

On the following morning (December 12) excellent conditions continued until 3.30. Dozens of stations were going at the same time — a most wonderful procedure considering the distance. Stations logged up to 3.30 are as follows: 3XM, code LXCAM; 1BKA, 1XM, 1BCG, 2EH, 2FP, 2ARY, 2AJW, 1ARY, 1RZ, all C.W., and 1BDT, 3FB, and 2EL, which were spark.

At 2.52 A. M. station 1BCG called and started what proved to be the first message ever sent across the Atlantic via Amateur Radio:

> Nr. 1 de 1BCG words 12
> New York date Dec. 11, 1921
> (12-1921) to Paul Godley,
> Ardrossan, Scotland.
> Hearty congratulations.
> (Signed)
> Burghard, Inman, Grinan,
> Armstrong, Amy, Cronkhite.

Reception of this message was completed at 3 A. M. He said "bi two hours," which was the last heard of him, for, between 3 A. M. and 4 A. M. signals began to fall off rapidly and no readable signals from American amateurs were heard during the remainder of the tests.

Atmospherics grew worse, and continued rapidly worse during the remaining long nights. Summerlike weather began to prevail, winds growing heavier and finally terminating in a cyclone which had swept clear across the Atlantic to wreck shipping on the way, and to cause a tidal wave which backed water up to a depth of two feet in the streets of Hull. We escaped the fury of this storm by dismantling on the late afternoon of the 16th.

On the 19th, when I had reached London, I found that great enthusiasm was being shown as a result of the tests. Station 1BCG had been heard by 5 British amateurs, by a Dutch amateur in Amsterdam, and by an American ship operator in the harbor at Hamburg, Germany, and all newspapers in Belgium, France and the British Isles were featuring the story.

British amateurs had also heard 1AFV, Salem, Mass.; 1UN, Manchester, Mass.; 1RU, Hartford, Conn.; 1XM, Cambridge, Mass.; 2FP, Brooklyn, N. Y.; 2ZL, Valley Stream, L. I. They also report that it is probable that 1ZE, Marion, Mass., was heard, as well as station 2ZU, whereabouts unknown. Their report states that C.W. stations only were heard, which eliminates 2ZC whom they logged, since 2ZC is a spark station.

A complete list of stations heard at Ardrossan is as follows:

Spark—1AAW, not yet located; 1ARY, Burlington, Vt.; 1BDT, Atlantic, Mass.; 2BK and 2DN, Yonkers, N. Y.; 2EL, Freeport, L. I.; 3FB, Atlantic City, N. J.; 8BU, Cleveland, Ohio; 9ZJ, Indianapolis, Ind., and 3BP, Newmarket, Ontario.

Continuous wave—1ARY, Burlington, Vt.; 1BCG, Greenwich, Conn.; 1BDT, Atlantic, Mass.; 1BGF, Hartford, Conn.; 1BKA, Glenbrook, Conn.; 1RU, Hartford, Conn.; 1RZ, Ridgefield, Conn.; 1XM, Cambridge, Mass.; 1YK, Worcester, Mass.; 2ARY, Brooklyn, N. Y.; 2AJW, Babylon, L. I.; 2BML, Riverhead, L. I.; 2EH, Riverhead, L. I.; 2FD, New York City; 2FP, Brooklyn, N. Y.; 3DH, Princeton, N. J.; 2ACF, Washington, Pa.; and 8XV, Pittsburg, Pa., with the probability that 4GL, Savannah, Ga., was also heard.

In glancing over the above lists one is struck by the preponderance of the C.W. stations, and by the fact that the British heard C.W. stations only. That can mean only one thing, that C.W. is far superior, and I should like nothing better than to see all amateurs change over to continuous wave at once. Spark methods are horribly out of date, and are so inefficient, comparatively, as to be ridiculous, were it not that many have invested good money in spark equipment. Station 1AFV, since the tests, has gotten three messages across to England (London) on 200 watts of C.W. Many stations of the Atlantic seaboard are reaching to the California coast with similar powers, while the west coast stations have been shoving signals into the Hawaiian Islands. The day is not far distant when amateurs the world over will be exchanging greetings in many languages, and by the same token, the day is almost here when spark stations will be of interest as having to do with history only.

Another Article by Mr. Godley

giving his impressions of radio men and radio methods in England,

will appear in the

APRIL WIRELESS AGE

American Stations Heard by English Amateurs

DURING the recent trans Atlantic amateur tests the following American stations were heard by W. F. Burne, Sale, Cheshire, England, approximately 40 miles from London.

2FP, H. C. Barber, 252 Neptune Avenue, Brooklyn, N. Y.
2BML, R. B. Bourne, P. O. Box 13, Riverhead, Long Island.
2ZL, J. O. Smith, 3 Corona Ave., Valley Stream, Long Island.
1BCG, Minton Cronkhite, Greenwich, Conn.
1UN, Joseph B. Dodge, 26 School Street, Manchester, Massachusetts.
1XM, Massachusetts School of Technology, Cambridge, Mass.
1ZE, I. Vermilya, 24 Allen Street, Marion, Mass.

Reception of the first three stations of the above list included the correct code words as well as the calls.

In the case of 1ZE there were one or two errors in the code word which, however, were easily understandable. 1UN and 1XM were in the "free for all" period.

Mr. Burne has been declared the winner of the first prize offered by several British concerns and organizations for having been successful in hearing the greatest number of American amateur stations. The aerial used by Mr. Burne is an inverted L, supported by one mast on his house and one in an adjoining garden. It is 56 feet high at the house end and 45 feet high at the other. The antenna is within the limited size allowed by the General Post Office, being only 45 feet long. The usual water pipe was used as a ground for the receiving set.

The set used in the record-breaking reception was mostly of home construction. Mr. Burne states that a friend of his classified it as "a glorified collection of junk." SOME JUNK!

The set consisted of the usual tuning devices, radio-frequency transformers and condensers, detector and audio-frequency amplifiers. On the first two nights of the tests four ES 4 valves were used, making a total of five with the separate external heterodyne. On the third night five tubes were used as radio-frequency amplifiers, in addition to the heterodyne. On succeeding nights six radio-frequency valves were used, with the occasional addition of one or two steps of audio-frequency amplifiers.

Heard by H. H. Whitfield

The following stations were heard by H. H. Whitfield, who was awarded the second prize offered by British concerns.

1AFV, F. C. Estey, Salem, Mass.
1BCG, Greenwich, Conn.
2ZL, Valley Stream, Long Island, N. Y.

In the first and third cases the special code signals were correctly received, as well as the the calls.

As in the case of Mr. Burne's station, the receiving apparatus used by Mr. Whitfield was composed of miscellaneous parts, loosely assembled on a table. The apparatus was all home-made, with the exception of condensers, tubes, batteries and head telephones. Six tubes were used. The aerial of Mr. Whitfield's station is composed of two wires, 40 feet high, running east and west, with the lead-in from the east end. The usual water pipe is used as a ground.

Heard by W. E. F. Corsham and R. D. Spence

W. E. F. Corsham and R. D. Spence were jointly awarded the third prize, each having heard one American station, as follows:

1AFV, Salem, Mass. Code group correctly received. Heard by Mr. W. E. F. Corsham.
2ZL, Valley Stream, Long Island, N. Y. Code group correctly received. Heard by Mr. R. D. Spence.

(Continued on page 45)

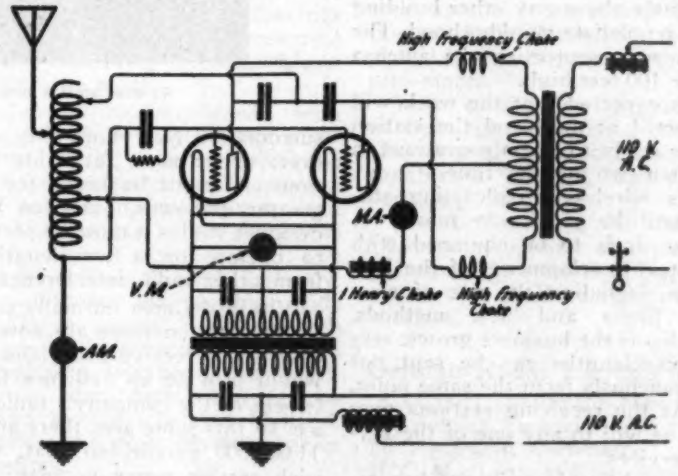
Equipment at 2ZL in Trans-Atlantic Work

THE set used at 2ZL station at Valley Stream, L. I., during the recent trans-Atlantic tests, when signals from the station were heard in England, employed two 250-watt Radiotrons, UV-204, in a self-rectification circuit as shown below.

A transformer, with a split secondary, supplies A.C. for plate potential, at 2,200 volts for each tube, 4,400 over all. The filaments of the tubes are heated with A.C., by means of a transformer, also with split secondary.

The value of the grid leak resistance used in shunt to the grid condenser is 20,000 ohms, and the capacity of the grid condenser .002. The antenna at 2ZL is an inverted L, 85 feet high at the end away from the station, and 65 feet high at the station end. The flat top is 120 feet long. The leads, four in number, are from the low end. The fundamental wavelength of the antenna is 210 meters. The antenna points southwest-northeast, with the leads on the southwest end. In view of the fact that the station was heard in England and at Monterey, Calif., at practically the same time, it seems to indicate that there are no directional effects.

A counterpoise ground system is used, consisting of 8 wires, on spreaders, directly under the antenna, and fanned out at both ends beyond the antenna. The resistance of the entire antenna and ground system is 7 ohms and the antenna current is normally 8 amperes on 325 meters, representing approximately 450 watts in the antenna.



Circuit diagram of 2ZL Station

WORLD WIDE WIRELESS

Hoover Selects Members Of Radio Conference

SECRETARY OF COMMERCE HOOVER announces he had asked the following to be members of the conference to meet for the control and development of radio telephony:

Dr. S. W. Stratton, chairman, director of the Bureau of Standards; representatives, one each, from the War Department, Navy Department, Post Office Department and Department of Agriculture.

Senator Kellogg, Minnesota; Representative White, Jr., Maine; R. B. Howell, Omaha; Dr. A. N. Goldsmith, Secretary of the Institute of Radio Engineers, New York; Prof. O. M. Jansky, Jr., University of Minnesota; Hiram Percy Maxim, President of the American Relay League, New Haven, Conn., and Prof. L. A. Hazeltine of Stevens Institute, Hoboken, N. J.

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American T. & T. Broadcasting Station

A PERMIT has been granted for the erection of a wireless telephone broadcasting station by the American Telephone and Telegraph Company on the roof of the twenty-four-story operating building between Walker and Lispenard streets, New York City. This building is 350 feet high and rises conspicuously above any other building in the immediate neighborhood. The steel towers supporting the antenna will be 100 feet high.

It is expected that the work will be started at once and the station will be ready to begin operations in less than two months' time.

This wireless broadcasting station will be unique in many respects. It is to be equipped with the latest developments of the Bell system, including the use of electrical filters and new methods, whereby as the business grows, several wavelengths can be sent out simultaneously from the same point, so that the receiving stations may listen at will to any one of the several services.

It will be unique in another respect, because it will handle the distribution of news, music or other programs on a commercial basis for such people as contract for this service.

The American Telephone and Telegraph Company will provide no program of its own, but will furnish the channels through which any one with whom it makes a contract can send out their own programs. Just as the company leases its long distance wire facilities for the use of newspapers, banks and other concerns, so it will lease its radio telephone facilities and will not provide the matter which is sent out from this station. There have been many requests for such a service, not only from newspapers and entertainment agencies, but also from department stores and a great variety of business houses who wish to utilize this means of distribution.

The new station on the Walker-Lispenard building is designed to cover a region from 100 to 150 miles surrounding New York City. However, under most favorable conditions, it might be heard for much greater distances, but even for its designed radius it must be permitted to operate on a wavelength free from other radio interference.

Within the area normally covered by this station there are now probably 35,000 receiving stations which would provide an audience for the lessees of the company's radio service. In this same area there are over 11,000,000 people, so that, should such service prove popular, it can reasonably be expected that the number of receiving stations will be greatly increased.

This is a new undertaking in the commercial use of radio telephony, and if there appears a real field for such service, and it can be furnished sufficiently free from interference in the ether from other radio services, it will be followed as circumstances warrant by similar stations erected at important centers throughout the United States.

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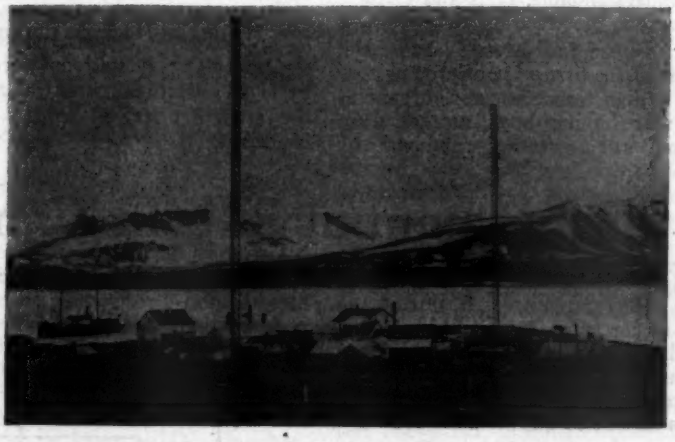
Multiplex Radio Operation Demonstrated

A LONG forward step in the science of radio communication was demonstrated in the Engineering Societies building, New York City, recently, when telephone and telegraph messages were carried simultaneously from a single wireless transmitting set and antenna. They were received also by a single radio set without interference or distortion, and brought down to clear and audible hearing.

The achievement was demonstrated by Dr. Frank B. Jewett, chief engineer of the Western Electric Company, and head of the Bell system research laboratories, and was made possible largely through an electrical "filter" invented by Dr. G. A. Campbell. The device makes it possible to separate the various frequencies at which the individual telephone and telegraph messages are carried.

Two specially constructed demonstration radio sets were placed in the auditorium for the benefit of members of the telephone society, who are chiefly electrical engineers and communication experts. The



Wireless station located at Green Bay in the Arctic regions

telephone and telegraph messages were dispatched at the same time and were received at the other end of the stage. They were detected by a single vacuum tube circuit, after which they were passed through the "filter," which separated the frequencies of the telegraph message from those of the telephone message.

"Mush" hearing "his master's voice" by radio at Keith's Royal Theatre, New York

The filter differs materially from the ordinary tuned circuits familiar to the radio engineer, as the filter separates not single frequencies, but bands of frequencies of any predetermined width. The filter makes it possible to separate the band of frequencies comprising the telephone message from the band comprising the telegraph message. It can also separate one telephone message from another.

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Naval Radio Bill Passes Senate

THE House resolution extending privileges of naval radio service to the press for five years has been adopted by the Senate. The bill applies particularly to naval radio between the Pacific Coast and the Orient.

Under an amendment, adopted by motion of Senator Poindexter, Republican, of Washington, in charge of the bill, the press privilege will extend also to radio between the west coast and Alaska and Hawaii.

President Harding urged Senator Poindexter recently to push the bill, which was indorsed at the International Press Congress at Honolulu. It authorizes the Secretary of the Navy to fix reasonable rates for radio transmission of news until June 30, 1927.

The bill now goes to the House for consideration of Senate amendments.

Dutch Papers Get News by Radio

WIRELESS telephonic journalism has been started throughout Holland, bringing good results. Fifty different newspaper subscribers of the Vasdiaz Agency at Amsterdam, equipped with a simple receiving apparatus, receive news throughout the day.

This is considered only the commencement of wireless telephony for journalism in Europe. Although not yet extended abroad, this service will undoubtedly follow. International laws requiring special Government permits for sending and receiving messages abroad are at present the only obstacles.

The Vasdiaz Agency received congratulatory messages from the Dutch Ministers and authorities and also from foreign Government officials, including Premier Lloyd George, who said:

Although over-burdened with work, I wish to express my great interest in the wireless telephone and hope the service will prove a great success in future journalism.

M. Vasdiaz said: Today's results have been most satisfactory. The sending stations worked perfectly.

A well-known Hague editor said: The Hague papers obtained excellent results in transmission by the new wireless telephone. Messages sent out from Amsterdam can be received by the whole of Holland. I consider it a great development in journalism.

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Shippers' Clearing House to Use Radio

AN announcement made by Jonathan Starr, president of the Shippers' Clearing House Company, brings to light a plan to utilize the wireless telegraph for tracing goods lost in transit. Losses now, according to the statement of Mr. Starr, annually cost shippers in the United States $109,000,000 through thieving and careless handling.

The plan comprises the establishment of radio plants throughout the country in thirty-five cities. A system of zones will be laid out which will make communication easy from one end of the United States to the other.

This service is not for transmitting commercial messages, or for public use. We merely contemplate help for shippers, who because of the delays which invariably accompany tracing by mail and telegraph are suffering severe losses in forwarding merchandise, said Mr. Starr.

The plants will be installed in New York, Boston, Hartford, Providence, Waterbury, Portland, Utica, Philadelphia, Harrisburg, New London, Pittsburg, Cleveland, Cincinnati, Toledo, Wilmington, Baltimore, Toronto, Detroit, Indianapolis, Chicago, St. Louis, Memphis, Nashville, Birmingham, Atlanta, New Orleans, Dallas, Omaha, Cheyenne, Salt Lake, San Francisco, Los Angeles, Seattle and Grand Rapids.

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Wireless to Be Compulsory on Aircraft

OWING to the agitation by aeronautical experts for wireless to be fitted to aircraft, the British House of Parliament announces that regulations are to be issued making the carrying of wireless apparatus by British aircraft compulsory as soon as the International Convention on Aerial Navigation has been signed by the majority of the signatory states.

This Convention provides for wireless apparatus being carried by aircraft used in public transport and capable of carrying ten or more persons.

The Air Secretary also stated that all large aeroplanes at present employed on the subsidised cross channel service shall be equipped with wireless.

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German Radio Interests in Italy

ACCORDING to the Agenzia Economica Financiaria, as reported by American Commercial Attache H. C. MacLean, at Rome, the Radiotelegrafica, a company having its offices in Rome, has acquired all of the patent rights of the Telefunken Company (German) for Italy, and has presented to the Italian government a plan for the construction of a high-power radio station.

E. F. W. Alexanderson Returns from Europe

RETURNING from a business trip of several months' duration to European countries, E. F. W. Alexanderson, wireless expert of the General Electric Company and chief consulting engineer of the Radio Corporation of America, brings word of the successful completion of plans for a big international radio central, to be built at Rio de Janeiro, Brazil.

Mr. Alexanderson went abroad to attend an engineering and technical conference comprising radio engineers of America, England, France and Germany, held at London. This conference considered engineering plans for carrying out international projects.

The conference agreed on engineering details regarding the new station in South America. That station, it is stated, will be modeled closely upon the big American radio central on Long Island, the main operating station of the Radio Corporation of America, and noted as the largest of its kind in the world. In addition to the station at Rio de Janeiro, there will be a sub-station at Para. South America already has one radio station at Buenos Aires, Argentina, erected by Germans, but now taken over by the new international company.

Plans for the station at Rio de Janeiro are now going through, but there has been no announcement as to when it will open.

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Radio Reduces Revolution in Mexico

WIRELESS telegraphy has contributed greatly to keeping down revolution in Mexico and the government, recognizing its value, is establishing stations in every large city in the republic.

Officials assert that by using the wireless they are able to communicate directly and immediately with military headquarters, and thus are able to head off many incipient uprisings which might grow into serious revolutions if not promptly checked.

In the old days the first thing a band of rebels did was to cut all telegraph and telephone wires, thus isolating the region of revolt.

In its station at Chapultepec Park here the Mexican government has one of the largest and best equipped plants on the continent. During the Carranza administration the station was practically idle, but during the past few months it has been used daily by the government in sending official news letters to Central and South American countries, and in keeping its ministers and consuls informed of affairs at home.

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Naval Stations on Pacific Coast

ASTORIA, OREGON, the seaport at the mouth of the Columbia River, will become one of the most important links in the radio facilities of the western coast of America, and of the entire Pacific Ocean with the completion of the improvements which the Federal Government has announced and which are already under way in their preliminary stages.

The two naval stations already existing at North Head and on Youngs Bay, short distances from Astoria, are to be enlarged and expanded until they are not only capable of handling the enormous wireless traffic which has grown up with the development of Astoria into a port of first rank on the Pacific Coast, but also of accommodating the radio business of years to come.

The station at North Head, in Washington, at the northern promontory at the mouth of the Columbia, will be furnished with a new power plant under the project which was recently detailed by Commander Milton H. Anderson, communications officer of the thirteenth naval district. New and enlarged apparatus is also to be installed at North Head.

Beside the present stations which are to be enlarged, the government has established two radio compass stations at the mouth of the Columbia to protect the river entrance. This harbor entry is said to be one of the safest in the world, for it has a depth of 43 feet at mean low water over a width of a mile. The radio protection afforded it, however, serves to make it still safer for mariners.

President Harding Has Radiophone Set

PRESIDENT HARDING has a radio phone set, which he uses to get music out of the air. He told about a concert he heard which he thought was in Anacostia, a suburb.

"No, Mr. President," some one ventured, "that concert was in Detroit."

"Well," returned Mr. Harding, "I am surprised. It was so plain I thought it was somewhere in the District of Columbia. I thought the Detroit Symphony Orchestra was playing here."

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English Radio Stations Recommended

THE Wireless Telegraph Commission has recommended to the Government the erection of stations in England, Canada, Australia, South Africa, India, Egypt, East Africa, Singapore and Hong Kong. The Commission spent a year in its study of the question.

The average cost of the stations is estimated at not more than £160,000, but the cost of those in England, Egypt, Singapore and Hong Kong would aggregate about £853,000. The Commission recommends two wavelengths for each transmitting station, and that each centre be equipped for receiving from several stations in the chain simultaneously.

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Radio Improves Mail Service

ANOTHER use for radio has been found by the Kreetan Lumber Company of Johnswood, Drummond Island, Mich. The radio is used by the company for dispatching and receiving important mail. Ordinarily it takes several days for mail of the company to go from Johnswood via the Soo to the mainland of Michigan. To obviate this the company uses the radio to Sheboygan and W. W. Kathan, local radio operator, forwards the letters from and directs replies mailed to Sheboygan, and they are repeated by radio service between the two places. Four days' time is saved by this method, it is estimated.

Amateur Station Calls

THE WIRELESS AGE for April will contain a list of Amateur Station Calls, in all districts, issued since June 30, 1921.

A "Dry Cell" Vacuum Tube

A NEW tube, which makes the use of a storage battery unnecessary, has recently been developed, according to H. M. Ryder, of the Westinghouse Electric and Manufacturing Co. Figure 1 shows the tube reproduced to about two-thirds actual size. It is somewhat smaller than most tubes and fitted with a base designed to prevent its being accidently placed in a socket supplied by a six-volt battery and thereby having its filament ruined. This base is also designed to prevent the accidental connecting of the plate potential to the filament terminals.

The filament requires but 1.1 volt to operate and uses 0.2 ampere continuously. This means a power consumption of less than one-fourth watt as compared with 3 to 5 watts in the ordinary tube filament. For this reason it is possible to operate the filament from a single dry cell and avoid the greater expense and trouble incident to the use of a storage battery. In addition to this advantage, a plate battery of 22 volts is sufficient for all work, except where the utmost in signal strength is required, in which case a plate potential of 30 volts will give slightly better results. A higher potential than this is never necessary and a potential above 22 volts is seldom needed. The tube is hard, so that the plate voltage adjustment is not critical.

An idea of how long a dry battery should last in the service required by this tube, is given in figures 2 and 3. In both cases it has been assumed that the tube is to be operated one hour out of each twenty-four. Figure 4 is added to show how the power obtained from a single No. 6 dry cell will vary with the rate at which the dry cell is drawn upon. Thus, if several dry cells in series were used to supply a filament requiring 0.8 ampere, only five ampere-hours would be available from each cell before its voltage would have dropped to one volt at the end of a one-hour run, while 22 ampere-hours would be available for supplying a filament requiring 0.2 amperes before the voltage would take a corresponding drop.

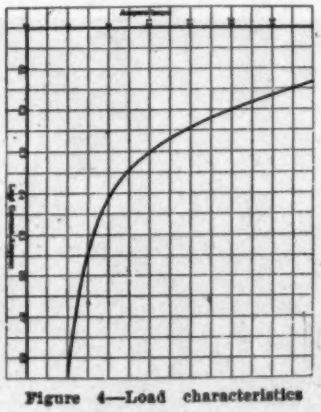


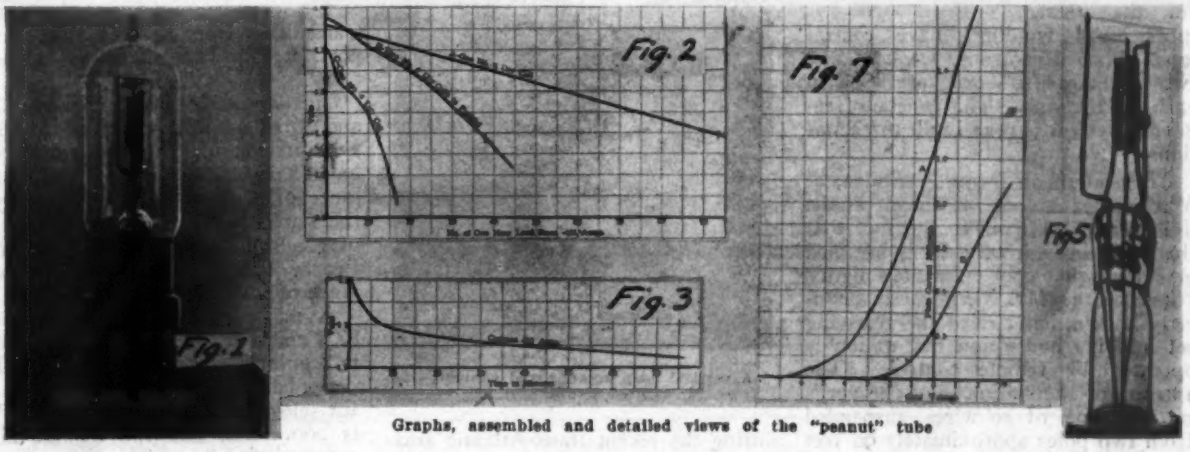
Figure 4—Load characteristics

This information illustrates the possibilities of this tube in a portable receiving outfit. It is probable that more such outfits were carried to camp during the summer of 1921 than during any previous season, in spite of the limitations imposed by a storage battery. This "dry cell" tube now makes it practicable for a camping party to carry a receiving set of small dimensions and weight, and of sufficient range to keep in touch with world affairs through the present radiophone broadcasting which has become general.

The advantage is not limited, however, to the portable set. In the home, a dry cell is always to be desired in preference to a storage battery, not only on the score of economy, but also because a dry cell may be located in any convenient place.

It is logical to ask how this great decrease in filament power consumption has been accomplished. The design of every essential element in the tube contributes to this end. Figure 5 shows the interior arrangement and figure 6 the elements which go to make up this structure. The filament is of platinum, about one-eighth as thick as fine tissue paper, and one one-hundredth of an inch wide. This is coated with a very thin layer of certain oxides with the result that a special form of Wehnelt cathode is formed. This filament is welded to end supports for easy assembly, and is kept in position by the aid of a specially constructed and very flexible form of spring. This spring enables the filament to move freely in case of a severe jar, but otherwise to be held firmly in place. It results in an exceedingly rugged structure for so delicate a strip. The grid and plate are of the common forms except that very small and exact dimensions are used. If accuracy and inspection were not carefully maintained, inoperative tubes would result. The assembly is centered about the electric welding

(Continued on page 40)



Graphs, assembled and detailed views of the "peanut" tube

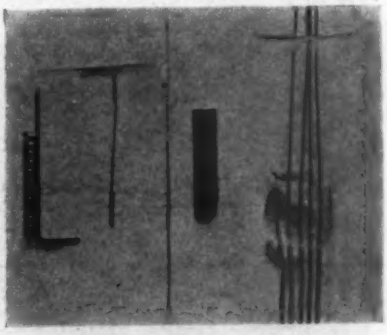


Figure 6—Elements of the "peanut" tube

Three Well-Known Amateur Stations

THE three amateur stations, 1ZE 8ZG and 9AKR, all equipped with 100-watt Kenotron outfits, have become so well known on the air that a detailed description of them will undoubtedly be of interest.

The transmitting sets used at these three stations are identical. A 750-watt transformer, with 110-volt, 60-cycle primary, has three windings, one providing high voltage, approximately 1,200 volts for the plates of the Kenotron tubes, another supplies 10 volts for heating the filaments of the Kenotrons and the third provides 10 volts for the filaments of the oscillator tubes. All windings have central taps. Two Kenotrons, UV-217 and two oscillators, UV-203, are used in each of the sets. The constant frequency system is used in all three stations.

The station of Irving Vermilya, at Marion, Mass., 1ZE, is shown in the illustrations. Owing to the fact that the shack in which the set is installed gets somewhat cool on winter nights, "Speedo," as Mr. Vermilya is popularly known, has moved the receiving set into his house and the station is operated by remote control. The antenna of the station is of the vertical fan type, of 20 wires, suspended from two poles approximately 90 feet high. A counterpoise ground, also of 20 wires suspended under the antenna, is used.

The C.W. signals of 1ZE station have been reported from Cristobal, Canal Zone, on the Pacific side of the Isthmus, and this station was one of those heard, and the code letters verified, by amateur stations in England during the recent trans-Atlantic amateur tests.

A vertical harp antenna and counterpoise is used at 8ZG station

In addition to these extreme and exceptional night distances, the station has carried on regular communication with the Eighth and Ninth districts. The daylight range of the station, with straight C.W., is approximately 150 miles. A magnetic modulator is used for voice communication and distances up to 75 miles are regularly covered during daylight by voice. A separate receiving antenna, consisting of a long, single insulated wire laid on the ground, enables duplex operation with other stations. The normal antenna current of the station is 5.2 amperes on 375 meters.

The station of A. J. Manning, Salem, Ohio, 8ZG, has made many exceptional transmitting records during the winter months. The set was installed on October 19 and on the same night signals from 8ZG were heard in the First, Second and Ninth Districts, and a complete message which was transmitted from 8ZG to 2EL, Freeport, L. I., was copied at Havana, Cuba.

On the night of November 12, 8ZG and 5ZA, at Roswell, New Mexico, were in communication for an hour, exchanging traffic, an overland distance of 1,400 miles. On January 6 the signals of 8ZG were reported as of good audibility by 6ALP, at Long Beach, Calif., an approximate distance of 2,100 miles.

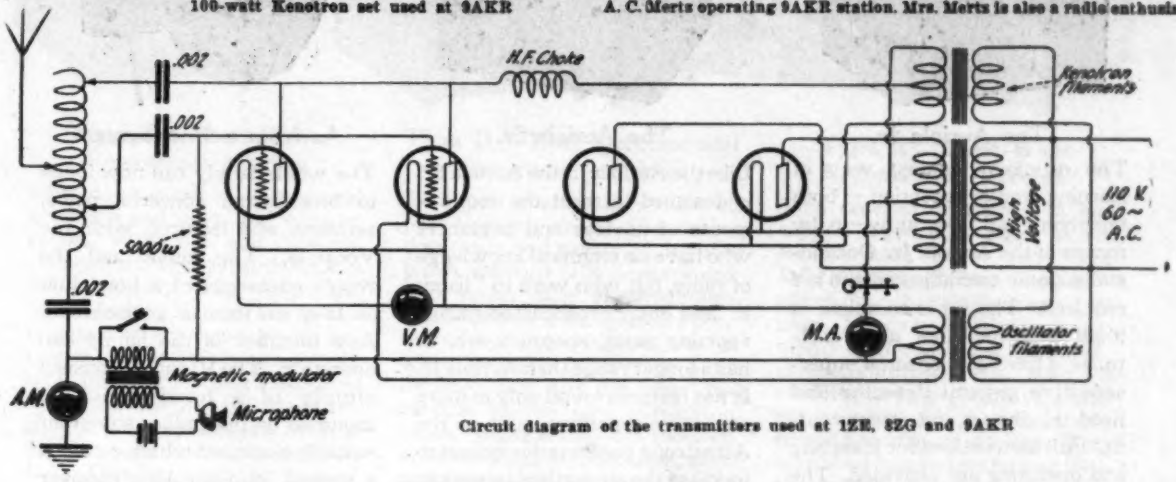
A magnetic modulator is used at 8ZG and a daylight range of 100 miles is regularly covered by voice. The dependable daylight range of the set for telegraphing, using straight C.W., is 200 miles, and the regular night range, 400 miles. The antenna current of the station is normally 4.5 amperes, on 375 meters.

The third station of the group, that of A. C. Mertz, Mount Carroll, Ill., 9AKR, on the northwestern corner of the State, has been heard several times on both coasts. As in the case of 8ZG, this station was reported

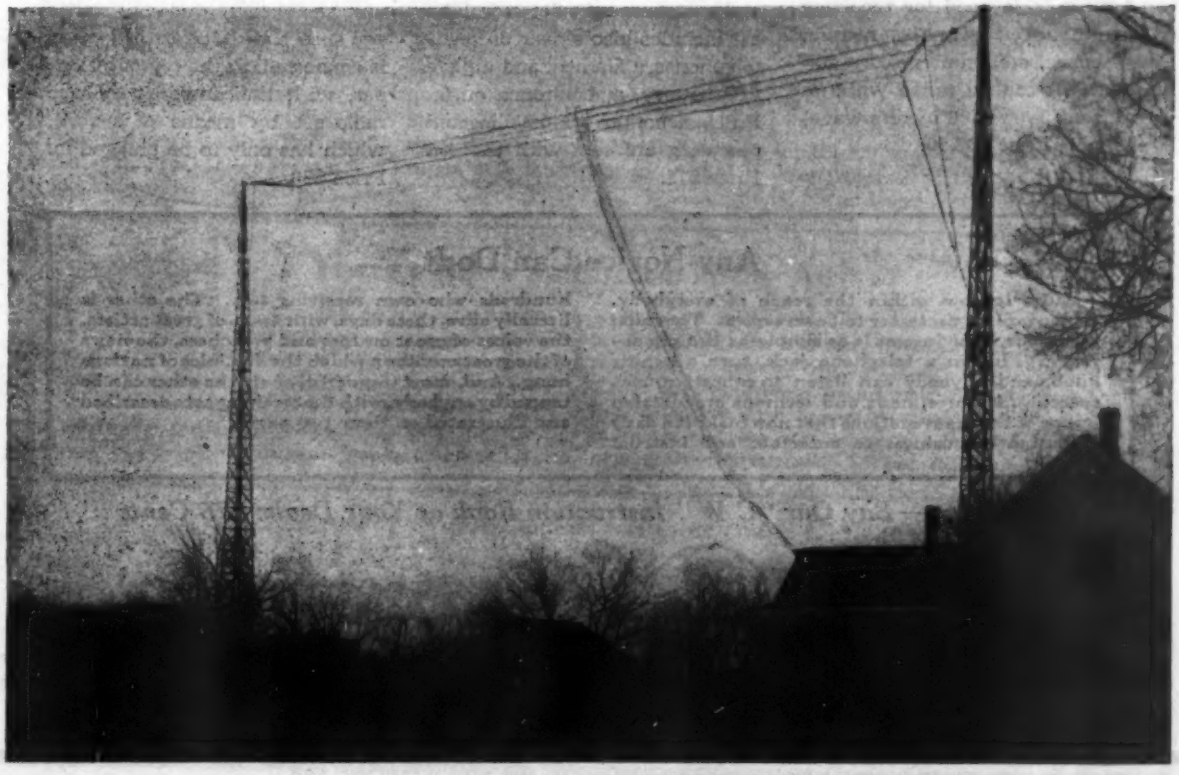
A. J. Manning, Salem, Ohio, operating 8ZG station, which is equipped with a 100-watt Kenotron set

100-watt Kenotron set used at 9AKR

A. C. Merts operating 9AKR station. Mrs. Merts is also a radio enthusiast

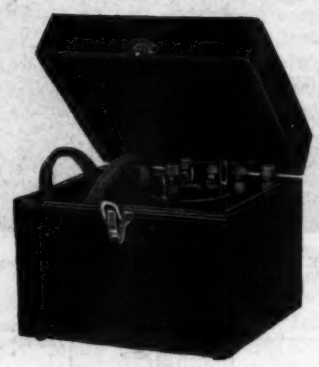


Circuit diagram of the transmitters used at 1ZE, 8ZG and 9AKR



The antenna system installed at 9AKR, Mt. Carroll, Ill., is of the T flat type at an elevation of 100 feet

Every Family Can



The Aeriola Jr.

The quickest, easiest way of learning radio reception — both telephony and telegraphy — is by means of the Aeriola Jr. Once installed, only two adjustments are required. The set is complete in itself and includes a variable tuner, a fixed condenser, a super-sensitive crystal detector and head-telephones, and antenna outfit. Full instructions for installing and operating are provided. The Aeriola Jr. is good for receiving broadcasted signals, music, speeches, etc. from nearby stations. It can be tuned within a range of 190 to 500 meters wavelength. Price $32.50.

The Aeriola Sr.

Like the Aeriola Jr. the Aeriola Sr. is designed to meet the requirements of novices and beginners who have no technical knowledge of radio, but who wish to "listen in" and enjoy broadcasted music, sporting news, speeches, etc. It has a longer range than Aeriola Jr. It has features found only in more expensive apparatus, such as the Armstrong regenerative circuit to increase the strength of reception, and a vacuum tube detector. The set includes also a pair of head-telephones, a filament and a plate dry battery, and antenna outfit. Full instructions for installing and operating are sent with the set. Price $75.

As from a Phonograph

The whole family can now listen to broadcasted concerts, news, sermons and lectures with the Vocarola. The music and the words come out of a horn, just as they do from a phonograph. Any member of the family can operate it. The Vocarola consists simply of a horn which is mounted on the wall or any other suitable place and which contains a special, loud-speaking receiver unit capable of reproducing music and speech without distortion. It is connected, in the regular manner, with the amplifier of the radio set by means of a cord, which has only to be plugged in. Price $30.

Any Novice Can Do It

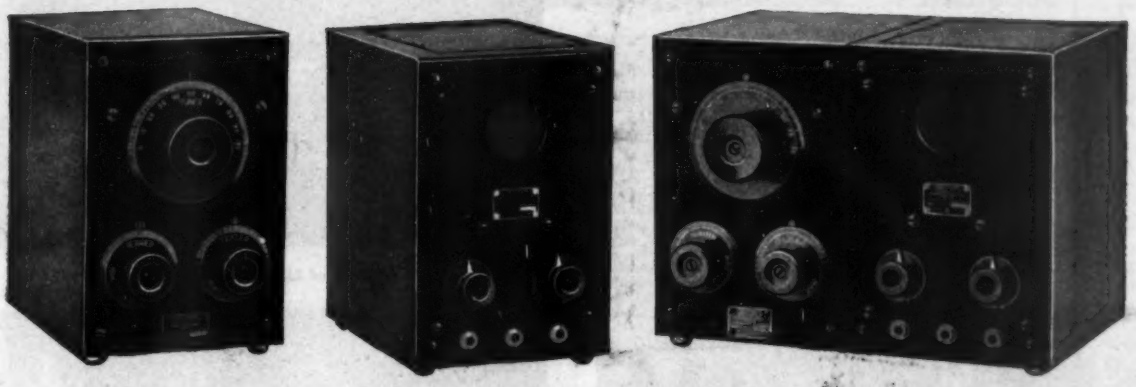
Radio is now within the reach of everybody. No longer is it necessary to be an expert. The radio telephone receiving set is as simple as the phonograph. Plug in a telephone jack, turn a tuning knob, and anybody can listen to concert music, speeches, lectures, news and sermons broadcasted by one of the many stations that now make it a daily and nightly business to entertain and instruct hundreds who own receiving sets. The ether is literally alive, these days, with songs of great artists, the voices of great orators and preachers, the news of the great events on which the destinies of nations hang. And, most wonderful of all, the ether can be tapped by anybody, with the receiving sets described and illustrated on these two pages.

Amateurs — Buy Our "C W" Instruction Book at Your Dealer, 25 Cents

Radio WORLD WIDE WIRELESS **Corporation of America**

Sales Division, Suite 1801
233 Broadway, New York City

Now "Listen In"



Type R A Short-Wave Regenerative Tuner

Most novices begin with crystal detection and later use vacuum tubes. With this unit they can change from crystals to tubes. Only one adjustment is required to tune in the desired signal. The device responds to any wave length between 180 and 700 meters simply by turning a knob. An adjustable tickler coil permits the use of regenerative amplification with a vacuum tube detector unit (Type DA). This tuner can also be used with Type DB Crystal Detector. Hence the novice can begin with crystal detection and later use tubes and amplifiers with this unit. A fine tuning adjustment is provided by a single-plate condenser for tuning in "CW" stations, or for receiving broadcasted music, news, etc. Price $65.

Type D A Tube Detector and Two-Stage Amplifier

This unit enables the novice to pass from crystal to tube detection easily and naturally. It gives him a vacuum tube detector and two stages of audio frequency amplification. Filaments are controlled by two rheostats, one of which regulates the current to the detector tube and the other the current to the two amplifying tubes. Signals may be received either without amplification, with one stage, or with two stages of amplification merely by inserting a telephone plug in the proper jack. The unit should be used with Radiotrons UV-200 as a detector and UV-201 as amplifiers, although UV-201 may be used throughout. Price (less Radiotron tubes and telephone plug) $68.

Type R C Short-Wave Regenerative Receiver

This receiver combines in one cabinet Type RA Short-Wave Regenerative Tuner and Type DA Detector and Two-Stage Amplifier, described elsewhere on this page. Hence it meets the requirements of the amateur or broadcasting enthusiast who wants a modern, compact, portable, efficient receiver which will enable him to hear distant stations. This is an ideal instrument for use with the loud-speaking Vocarola. Messages may be received with the detector alone or with one or two stage amplification. Used with a load-coil (Type CB) signals can be received on wave lengths up to 1,600 or 2,800 meters, depending on the antenna. Price (less Radiotron tubes) $125. Type CB Load-Coil can be supplied for $5.

There's News and Music in the Air

Some of the sets like the Aeriola Jr. and the Aeriola Sr. are so simple that even one who has no knowledge of electricity whatever can set them up and "listen in" to the messages and music sent by broadcasting stations or by enthusiastic radio amateurs. Other, more sensitive sets, described and illustrated on this page, can be operated after a few hours' experience. By connecting a Vocarola loud-speaker with the more efficient sets shown *the whole family* can "listen in."

Radio telephone broadcasting now takes its place in the home as a permanent *means of family entertainment and the entertainment costs practically nothing after the apparatus has been installed.*

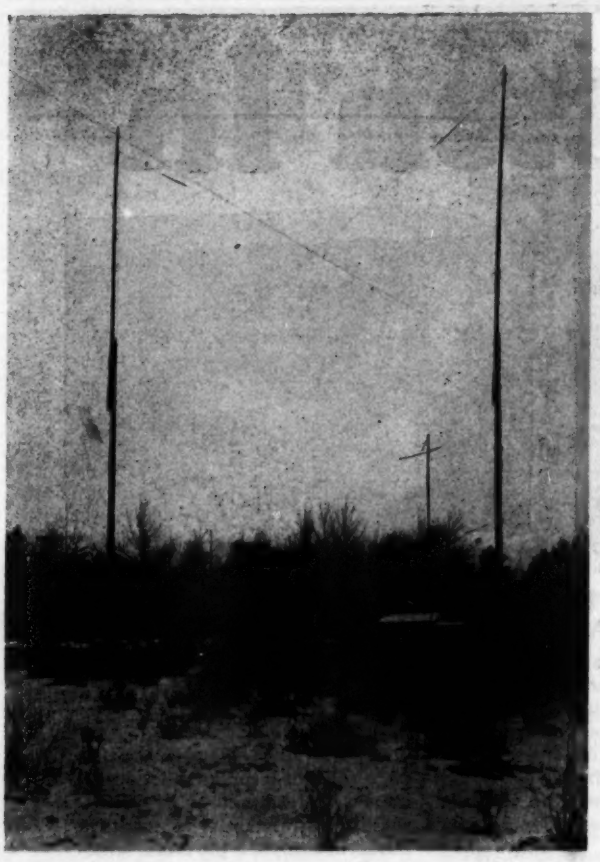
Dealers—For Quick Turnover Handle the R C A Line

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Division, Suite 1801

233 Broadway, New York City



The vertical harp type of antenna installed at 1ZE

Irving Vermilya of Marion, Mass., operating 1ZE

The 100-Watt Kenotron installation at 1ZE

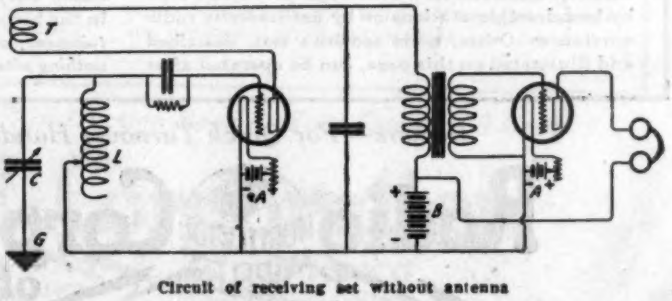
from exceptional distances the first night it was operated, and communication was established with 8AWP, Syracuse, N. Y.; 5ZA, Roswell, New Mexico, and 9AMB, Denver, Colo., through considerable static. During January the signals of 9AKR were reported from several points on the Pacific Coast and also by stations in Massachusetts and Rhode Island. The dependable daylight range of 9AKR is 200 miles, using C.W. for telegraph communication, and voice communication, using a magnetic modulator, is regularly carried on over 100 miles. The normal antenna current of the Station is 4.2 amperes, on 375 meters.

A Radio Receiving Circuit Without Aerial

By Lee Sutherlin

THESE are days when so many things are being done in radio telegraphy and telephony that most of us are inclined to take much of the new development as a matter of course. If we consider all of the minor details of receiving circuits we soon find that there are scores of different ones. The exact circuit to be used in any case usually depends upon the apparatus at hand.

The accompanying diagram shows a circuit which can be made up by using a small amount of relatively simple apparatus, to be used without an aerial. The values of the constants of the circuits are the same as those used in any ordinary short-wave receiver with one stage of audio amplification. It is not necessary to use separate "A" batteries as shown. The tuning is accomplished by varying L in steps and making fine adjustments with C. The ground employed was the water pipe of a local heating system.



Circuit of receiving set without antenna

Using the above circuit, the writer, located just outside of Washington, D. C., was able to hear the concerts sent out by KDKA, the broadcasting station of the Westinghouse Electric and Manufacturing Co., at East Pittsburgh, Pa. KDKA was using 650 watts in the antenna. During the past year while located in Pittsburgh, Pa., I often heard the high power stations of the East Coast and Canada with a single tube and without an aerial.

RADIOPHONE BROADCASTING

The Future of Broadcasting

BROADCASTING by radio telephone is destined to have an effect on social and political life comparable to the invention of printing. Its effect on national artistic development will equal that of the moving pictures. Its possibilities have not yet begun to unfold themselves, and its problems yet to be solved are tremendous.

These are a few of the impressions gleaned from an interview with Dr. Goldsmith, published in the New York Globe. Dr. Goldsmith is professor at the City College of New York, director of the radio telegraphic and telephonic laboratory at that institution, secretary of the Institute of Radio Engineers, director of the research department of the Radio Corporation, and former consulting engineer of the General Electric Company.

"Radio broadcasting," predicts Dr. Goldsmith, "will provide the school, the theatre, the lecture platform of the future. A man will be able to have in his own home, the news, the latest play, the opera, a lecture, or a political debate. He will not be required to accept one of these alternatives at any given time, but will be able to choose any of them, since they will all be sent out concurrently on different wave lengths.

"The result on the political life of the country will be incalculable. The United States is a particularly scattered nation, dependent almost entirely for its unity on the rapidity of its means of communication. The latter at present consists of the press, the periodicals, the wire telegraph, and telephone.

"The two former are by their very nature, deferred in their effect in greater or lesser degree. The two latter are immediate, but personal, reacting generally only between individuals. They reach a definite point; the radiophone covers an area. In radio broadcasting is the means of both immediate personal contact—between the officials of the government and its citizens, between the candidate and his possible constituents. As a result reactions to great issues will be direct, swift, and unaffected by geographical differences. The nation will be integrated to a degree never conceived of, and the resulting effect on our life and institutions is equally inconceivable.

Broadcasting Stations

WJZ—360 meters. Sundays, Tuesdays, Thursdays and Saturdays, 11 A. M. to 10 P. M. Westinghouse Station located at Newark, N. J.

KDKA—360 meters. Daily, 8 to 10 P. M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.

KYW—360 meters. Daily, 8 P. M. Central time, 9 P. M. eastern time. Westinghouse Station located at Chicago, Ill.

"The effect on the nation's artistic life will be equally great. As the motion pictures have stimulated people's artistic visual images, so will the "Movies of the Ether" stimulate their aural images. It can reasonably be predicted that popular taste in music and the spoken drama will be immeasurably uplifted."

Dr. Goldsmith also pointed out another analogy between the radio and the movies, in that the former is a projection of a special sort of electro-magnetic or light wave, and the latter of an ordinary light wave.

"However," he continued, "the radio telephone has certain definite provinces. It will not, as some imagine, replace the wire telephone. Upon the latter will always depend the basic communications in congested districts; just as transoceanic communication, and communication affecting moving bodies and across inaccessible spaces must inevitably be the province of the wireless. Between these two extremes is a large field whose disposition between wire and wireless only the future can determine. But each has essential limitations which will prevent it ever crowding out the other.

Professor Goldsmith made it clear that in its own field the radio was as completely practicable as the wire. In the matter of privacy he explained that instruments have been invented, such as the crypto-code machines, which send out messages in code with tremendous speed, and decode them at the receiver. Anyone listening in would find it practically impossible to pick up the message, or if he did so, to decode it in time to be of any use. Furthermore, these machines can alter the code as often and as irregularly as may be desired. In the field of radiotelephony there is being perfected an instrument which sends out the voice so greatly distorted that a "tapper" would hear mere gibberish; the receiver for which the message was intended, however, picks it up and renders it immediately intelligible. Further the method of distortion is continually changing, so that no listening in could be successful for a very long time.

\+ \+ \+

Babe Ruth at WBL

IN greeting his invisible listeners, Babe said:

"I was born in Baltimore and they christened me G. H. Ruth, but whether you know me as George Herman, Babe or Bambino, just let me say that it's a great pleasure to talk to you through the ether. This is an exceedingly pleasant visit to your great city, with its throbbing industries, and I am happy to meet people who have given so much of their wealth to the needy. And by the way—I'm singing this week at the Temple. Come and hear me. There are always plenty of doctors on hand."

A SERVANTLESS HOUSE AT LAST
Equipped with Receiving Radio Phone.
$2,500
CASH AND $7,500 ON Easy Terms Takes Title.
7 ROOMS, Tiled Bath.
Fine plot 100 x 144 ft.

An advertisement showing the new household status of radio

WDY to Locate in New York

THE Radio Corporation closed down its popular broadcasting station WDY, at Roselle Park, N. J., on Friday, February 17. This move is preparatory to the opening of a station in the heart of New York City.

WJZ, the Westinghouse station at Newark, will broadcast the programmes during the period that WDY is being installed in its new home. WDY and WJZ have been working in conjunction with each other for some time, and no inconvenience will be felt by the far distant enthusiasts by this announcement. When WDY starts to broadcast from New York, WJZ will be silenced.

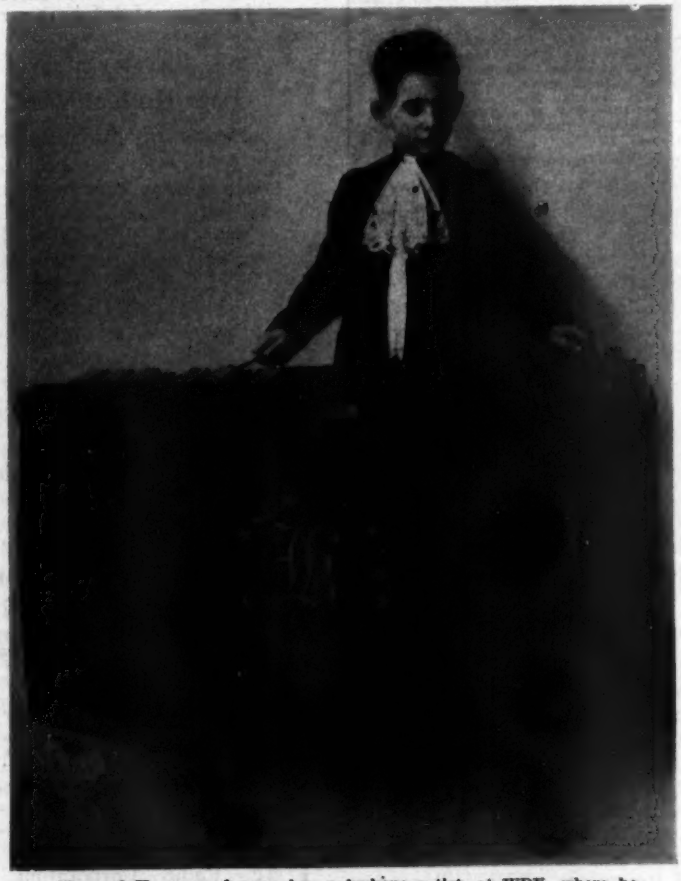
The new station the Radio Corporation will open in the metropolis will be the last word in radio. Every conceivable appliance which in any way

will give a better service to the wireless fan is being installed. In appointment it will far surpass anything now being used for broadcasting. It might be well to mention here that this move is not one of destructive competition but rather one of co-operation. The Radio Corporation is the sole sales agent of the Westinghouse Manufacturing Company for radio parts and equipment, and it is because of this close connection that the above move is being made for the improvement of the service.

"A Perfect Fool" by Radio

NEVER did a theatrical troupe look forward to a performance with greater enthusiasm than did the two dozen members of Ed. Wynn's "A Perfect Fool" company, on the occasion of their appearance at WJZ.

The novelty of the occasion appeared to act like an intoxicant on the company, and critics and theatrical persons who have been in steady contact with the show declare that never was it so well played.



Sigmund Kempner, famous boy xylophone artist, at WDY, where he rendered one of the most enjoyable broadcasting programs

Certain stunts were tried for the effect of the radio audience, such as high notes so beautifully sung by Janet Velie and Guy Robertson, which they do not attempt before their auditors in the George M. Cohan Theatre.

No one of their huge audience enjoyed the occasion more than the actors themselves. Several, including the star, experienced a novel attack of stage fright in the beginning, but later played with an enthusiasm that only gala nights in the theatre are able to arouse. Wynn was in fine fettle, continually interspersing with his familiar lines amusing remarks suited to the particular occasion. Guy Robertson, the debonair young tenor, who made a huge hit with his listeners, on each appearance before the microphone, carefully parted his blond hair with a comb borrowed from True Rice, who put it to similar uses, and the ladies of the cast made vigorous use of the powder puff before picking up their cues. Even to the calling time by the call boy, the situation outside the little studio resembled the backstage of a Broadway theatre.

Those of the audience familiar with the show recognized that it was being given in the same order and exactly the same manner as on the stage of the George M. Cohan Theatre. In fact, nothing was left home save the scenery and the ballet. As to the latter, Mr. Wynn explained that a ballet always wore too few clothes "to be sent safely through the air on a winter's night."

One very pleasing feature of the performance was the work of the orchestra, led by Leon M. Rosebrook. Its playing, both in support of the performance and in its separate numbers, met with high favor.

The close contact established between the players and the audience was time and again illustrated by the the spontaneous applause or laughter which broke out in each home on the "circuit" at a song or sally. When Wynn announced an intermission for the purpose of "feeding the actors" hostesses who were giving a radio party arose to follow suit in supplying refreshments to her guests, for which the latter are deeply grateful to Wynn.

✦ ✦ ✦

Tufts College Musical Club at WGI

"ALL dressed up and no one to see" might have been the title of the wireless entertainment given by the Tufts College Musical Club one night at WGI, Medford Hillside, Mass.

Although specifically told not to doll up, as no one could see them, some of the college boys could not conceive of singing to an audience of ten to thirty thousand and not being seen. And so, on the night of the radio performance, they appeared in their "soup and fish" with clean collars and plastered hair parted in the middle. It was a shame, for there was no one to admire their stylish dress suits and clean-cut appearance — no one but the whirring motor generators and a taciturn radio operator.

"Listening in" From Ontario to Cuba

EVEN though the WJZ and WDY combined radio program states that "the program can be heard by any one with suitable radio receiving apparatus within a radius of several hundred miles of New York" the radius is considerably greater than that, as proven by the daily correspondence received by the two broadcasting stations, WDY and WJZ.

The most enthusiastic radio fans reside a thousand or more miles distant from New York. The following letter received from the mining region of northern Ontario is interesting and conveys an idea of the benefits to be derived from the development of radio telephone broadcasting, as well as establishing its economic place in the affairs of the world. The letter, dated January 9, written by M. J. Caveney, 3 G.G., Sandy Falls, Timmins, Ont., and addressed to WJZ follows:

"I am located in the Temagami Forest Reserve, seven miles from the end of rails in northern Ontario. I have no idea of how far I am from Newark, N. J., but the range as shown in the various radio journals of your station is given at 300 miles. Anyway, you come in here swell, just like right in the room with you folks over there,

and your operator is an old friend of ours—we know his voice so well.

"Last week, I took the set back into the bush about twenty miles to a new camp—all mineral rock for miles, gold and silver mines all through this country—and, after scratching around for some soft place for a ground wire I discovered a place where I could drive an iron pipe in between two huge boulders. Got it down about three feet and then threw a wire over a tree.

"Just as I thought—in comes old WJZ, and the miners' wives tore the head-phones apart trying to let all listen in at once.

"I stepped outside the shack for a while, while they were listening to you inside. It was a cold, clear, bright night, stars and moon hanging like jewels from the sky, five feet of snow, 42 below zero, not a sound but the trees snapping in the frost and yet, if everybody only knew it, the air was full of sweet music.

"I remember the time when to be out here was to be out of the world—isolation complete—not a soul to hear or see for months on end, six months of snow and ice, fighting back a frozen death with an axe and wood stove in a seemingly never ending battle.

"But the long nights are long no longer—KDKA and WJZ are right here in the shack shortly after sundown, and you come in so plain that the dog used to bark at you, even though I had the head-phones clamped tight on my head. He does not bark any more—he knows you the same as I do—just pricks up his ears at first, then sits blinking at the bulls and listens.

"Long life and prosperity, WJZ."

Another extreme point that has been reported comes from Tuinucu, Cuba. The letter to WJZ was written by Frank H. Jones, electrical engineer of the Tuinucu Sugar Company.

"After listening to your fine program last night I must write to you to congratulate you. Have been enjoying your broadcasted news and music, etc., since November 18 nearly every night.

"The music came in very clear and loud last evening and I had about twenty guests in my house, and there were people out in the street, sixty feet from the loud speaker listening to the music.

"Inasmuch as in your final talk you asked distant receivers to report to you, I though you would be especially interested, as Tuinucu is in the center of the Island of Cuba, about 1,450 miles from Newark. I set my watch regularly with your relay of Arlington time signals."

Broadcasting Market News

By S. R. Winters

PROBABLY 4,000,000 persons in eight States — Missouri, Wisconsin, Kansas, West Virginia, Tennessee, Georgia, Illinois and Arkansas—have seen actual demonstrations of equipment and methods employed by the Bureau of Markets, United States Department of Agriculture, in distributing market reports by radio-telegraphy and radio-telephony. The Government receiving apparatus, supplemented by graphic panels illustrating the value and extent of the market-news service by wireless, formed a striking section of the exhibits of the Department of Agriculture, displayed at the fairs in the States mentioned.

The second panel described the extent of the Market News Service, thus "Market Reports Now Being Broadcasted over the United States from the Sending Stations Indicated." These sending stations were: Elko, Rock Springs, North Platte, Omaha, St. Louis, Cincinnati and Washington. The third panel in the series displayed was used for posting the market reports as received at the various fairs at specific hours. The photograph, presented herewith, was made at The Southeastern Fair, Atlanta, Ga., when reports of the conditions of the markets were being received from Cincinnati.

Radio market reports exhibit at State fairs

The diversity of Government exhibits was considerably augmented by this novel exhibition. Literally, reports of price fluctuations in the food markets were taken from out of space and posted on a bulletin board to demonstrate the effectiveness of a nation-wide service of disseminating information "from the markets to the producer." Or, to again employ the words of one of the exhibition panels, "A Valuable New Market News Service —Comprehensive, Speedy, Accurate."

Two wirelesss receiving sets and an equal number of trained operators were required to cover the territory mentioned in the three-months swing around the Government fair circuit. A 110-foot four-strand aerial, was transported from place to place as the schedule of the exhibits might indicate. Three panels formed an integral part of the exhibition equipment. The larger panel of the group was devoted to advertising the service and the benefits to be derived from the service.

The innovation of distributing market news by radio-telegraph and radio-telephone, wherever actual demonstrations were given, was received with cordial support and the consensus of opinion was that the service should not only be continued but expanded.

Universities in the various States are co-operating with the Department of Agriculture, in popularizing and enlarging the usefulness of the service of market news by radio. Educational institutions in Wisconsin, Ohio and Minnesota are already broadcasting the Department's market reports to the agricultural areas. Kansas, Missouri, Nebraska and Indiana are contemplating a like procedure.

✦ ✦ ✦

Actors Install Receiving Set

THE first radio telephone to be installed back stage in a New York theatre was set up and placed in operation recently at the Music Box. The instrument is owned jointly by the members of the "Music Box Revue" cast, and was purchased by them so that they may be able to "listen in" to other entertainments during their stage waits.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Filament and Plate Current Direct From A.C. Supply

By Joseph Graff

FIRST PRIZE $10.00

HERE is a detailed description of apparatus which I used for three months to replace both "A" and "B" batteries in the operation of two Radiotron UV-200 tubes acting as detector and audi-frequency amplifier, respectively. The sketches give the general construction of the device.

I never had a storage battery and the dry cells that I used were not going to last more than twenty-five or thirty hours, so I had to set about and get some means of maintaining my precious tubes.

I read several articles in THE WIRELESS AGE regarding the application of A.C. to the filaments of power tubes, and decided that this was to be my only hope. At first I experimented with rectified current for the filaments, but had trouble with the electrolytic rectifiers, and also experienced a sixty-cycle hum in the phones, so I gave up this method. Straight A.C., using a center tap on the transformer, gave a hum in the phones that could be heard QSA in any part of the room, but by using a potentiometer as illustrated in figure 1, I was able to eliminate every slightest trace of the sixty cycles.

As shown in the circuit, figure 1, a step-down transformer is used which delivers two voltages, six and forty, for the filament and plate, respectively. The plate coil is doubled, so that both halves of each cycle may be used. The electrolytic rectifiers work excellently on this potential. The filter condenser is of three microfarads capacity and effectively removes the ripple. A potentiometer of four thousand ohms resistance is shunted across the D.C. terminals, which gives the necessary adjustment for the Radiotron.

The specifications for the transformer used are as follows: Core: 4 inches by 5 inches by 1 inch made up of laminations of silicon steel, single coat of shellac. Primary: 440 turns of No. 22 D.C.C. wire wound on two long legs of core 220 turns to the leg.

Secondary (high voltage): 320 turns of No. 3. D.C.C. wire, wound over primary 160 turns per leg; tap taken between windings at 160 turns. Secondary (6 volts): 24 turns of No. 18 D.C.C. wire wound on two short legs of core. Shellacked paper was used for insulation throughout, between core and primary, between primary and secondary, between 5-

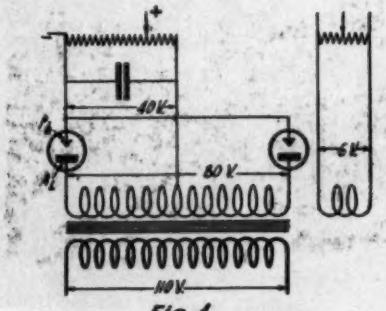


Fig. 1

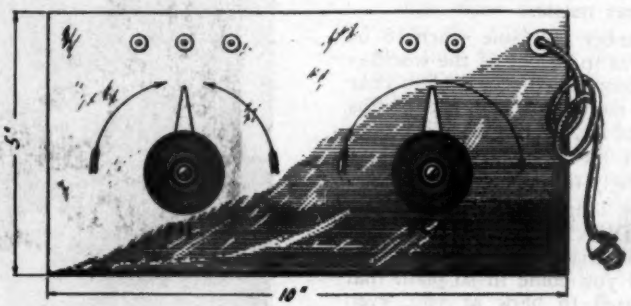


Fig. 4

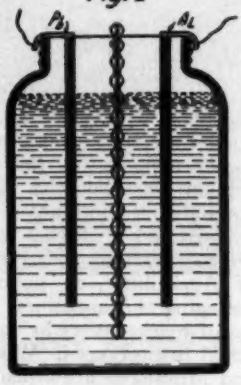


Fig. 3

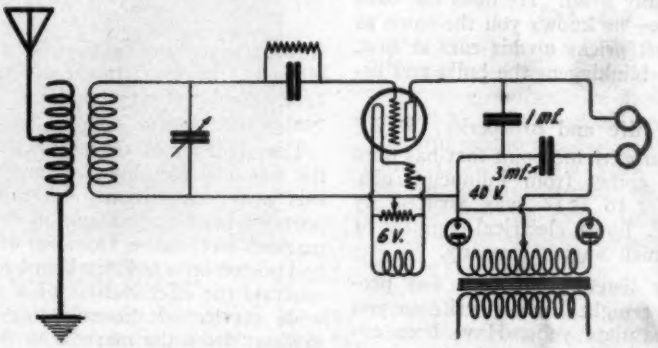


Fig. 2

Transformers, electrolytic rectifiers, hook-up and assembly of current supply device

volt secondary and core and over secondaries.

The electrolytic rectifiers are made of 100 cubic centimeter jars filled with a saturated solution of borax. A strip of tin and aluminum are suspended in each one by bending the upper end over the edge of the jar as shown in figure 3. Perforated corrugated cardboard, impregnated in paraffine, may be used to separate the strips.

I have this whole unit mounted in a cabinet 10 by 5 by 5 inches, and the two potentiometers and the required binding posts brought out on the front panel. For the sake of convenience and safety I used a cord and plug which screws into the light socket. A front view is given in figure 4. In conclusion may I say that this cost me less than two dollars.

The Case Against the Storage Battery

By Jack Greenfield

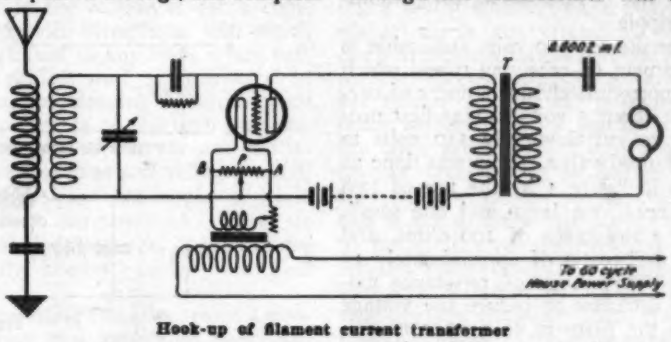
SECOND PRIZE $5.00

I HAVE been wondering for a long time why the storage battery as used for receiving tube filaments was not brought before the amateur's bar of justice and condemned. It is therefore gratifying to see THE WIRELESS AGE take the initiative in the matter and put the question up to us to decide. I firmly believe that the storage battery in its specific use as a source of current for receiving tubes has outlived its usefulness.

The initial cost of the battery is high as every amateur knows. But worst of all the initial cost has nothing at all on the upkeep and inconveniences attached to its use. Charging takes time and if you have only one battery you have to close shop until it is charged. In the next place charging batteries is an expensive proposition. Most of us have A. C. power in our homes and therefore cannot charge our batteries unless we have a Tungar Rectifier outfit. As a result we have to lug our batteries to a central station for charging and pay for charging the battery. Then again, if you take care of the batteries yourself there's the sweet job of keeping tabs on the specific gravity of the electrolyte and changing it every now and then — while you burn holes in your clothes with the acid.

These facts condemn the storage battery for use on receiver tube filaments. The use of A.C. on receiver bulbs has also been condemned by some because of the 60-cycle hum being repeated in the phones. However, if the proper type of circuit is employed A.C. can be used with excellent results.

The circuit described elsewhere by H. Brown and as used by the writer is shown in figure 1. The filament is supplied by A. C. 60 cycles stepped down by a transformer to give about 6 volts. The transformer can easily be made, or better still, an ordinary bell-ringing transformer can be used for the purpose. A series resistance consisting of the ordinary filament rheostat is used to vary the filament current. Across the low tension side of the bell-ringing transformer is placed a potentiometer P of about 1,000 ohms, the center point of which is connected to the grid. Unless this connection is made to the grid from the center point the hum will not be eliminated, because if the grid is connected to either end of the filament, it will have large 60-cycle voltage variations impressed on it. Thus suppose it is connected to point A of the filament, or point B. The potential at these points is either plus 4 volts or minus 4 volts, since the A.C. voltage is of that value. When the voltage wave has passed through one complete cycle the potential at either of the points has changed from plus 4 volts to minus 4 volts, or has changed from minus 4 volts to plus 4 volts. This change is so great that the 60-cycle hum must of necessity be impressed on the grid and repeated in the plate. It is therefore necessary to find a point on the filament which is neutral with respect to these voltages, and to connect the grid to it. By connecting a potentiometer as shown this is accomplished. For since one end of the potentiometer is at plus 4 volts and the other at minus 4 volts, at some point in the potentiometer the voltage changes sign, and this point is the neutral or zero voltage point. This will, of course, be in the center of the potentiometer and can be located by varying the potentiometer until the hum is reduced to a minimum.



Hook-up of filament current transformer

This connection alone will give very good results. However, by utilizing one other modification, the very best results can be obtained. This modification is shown in the plate circuit of figure 1. A transformer T is connected in series with the plate battery, the high voltage winding being connected to the plate. The low voltage winding is connected to the head phones in series with a condenser of capacity .002 mf. The transformer should be such that its transformation ratio applied to the headphones will give most efficient results. That is, the impedance of the plate circuit must be equal to the plate resistance of the tube. Suppose the tube has a resistance of 10,000 ohms, and that a pair of 2,000 ohm phones are used. If the transformer ratio is 2 to 1 the phones inserted in the plate circuit through the transformer will have a resistance of 2 square times 2,000, or 8,000 ohms. Thus the right transformer would have a ratio approximately a little higher to make the resistance 10,000 ohms. The ratio would be about 2.5. The action of the transformer condenser circuit in reducing the 60-cycle hum follows: The circuit reje ts the 60-cycle hum on account of the impedance offered to it by the small condenser in series with the phones. The impedance of a condenser is inversely proportional to the frequency, consequently the above condenser will show a greater impedance to the 60-cycle hum than to the 500-cycle note. The impedance will be 8 times as great. Consequently the 60 cycles will be swamped by the 500 cycles of the received signal, should any 60 cycles get through.

Thus we have the 60 cycles practically eliminated by the use of the filament transformer and potentiometer. The small remaining 60-cycle hum is effectively eliminated by the plate filter circuit above described. This circuit, it will be seen, does away with the storage battery, and substitutes A.C. power supply where it is available. The cost of the apparatus required is negligible compared to that of the storage battery and its upkeep.

Eliminating the Storage Battery on Receiving Tubes

By Louis Frank

THIRD PRIZE $3.00

BECAUSE of a number of disadvantages which the use of the storage battery presents, most amateurs would be glad to use other means of lighting their receiving tubes, and thus dispense with the storage battery if they only knew how. I want to describe a circuit which does away with the battery and which I have found quite successful.

When I started to look into the question of using the house power supply for the receiving tube filaments, the power which I found available was 110 volts D.C. The main problem in using the 110-volt line is that of eliminating the commutator ripple.

To make the 110 volts applicable to the filament of receiving tubes, which take approximately one ampere of current at about 5 volts, it was first necessary to cut down the 110 volts to the required value. This was done as shown in figure 1 by the use of two resistances, one large and one small. R1 is a resistance of 100 ohms, and R2 is a rheostat of approximately 15 ohms. This range of resistance values is sufficient to reduce the voltage across the filament to proper magnitude, and still allows sufficient leeway to permit of adjustment and variation by means of the rheostat R2.

Various filter circuits were tried to cut out the commutator ripple, and a very simple one was found to give as good results as the most complex. The filter circuit consists essentially of one condenser of capacity ½ to 1 microfarad, and one iron core choke coil, with an inductance of approximately 50 millihenries. The condenser is placed directly across the 110-volt mains, as in figure 2, and the iron core choke coil is placed in the positive lead of the line. Placing it in the negative lead will not yield as good results. The condenser used was a paraffined paper condenser of the Western Electric telephone type, but any condenser of the correct values will do. The iron core choke was roughly put together, by winding about 100 turns on an iron core about three square inches in cross section.

One further adjustment was found necessary. A high resistance of 150 ohms was formed in the manner of a potentiometer and placed across the filament terminals. The grid connection was then made to the movable contact of the potentiometer and, with the set operating, trials were made with the contact of the potentiometer moving from one end to the other. The poorest results were obtained when the moving contact was at either end of the potentiometer, and the best results showing the least amount of commutator ripple, was obtained with the moving contact somewhere near the center. The best position was obtained by trial, of course, and this position fixed by a mark on the potentiometer. Using the above filter circuit and potentiometer arrangement good receiving can be done. The expense of this circuit will be seen to be very low.

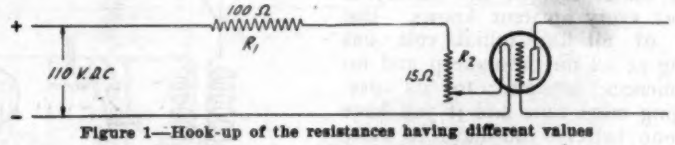


Figure 1—Hook-up of the resistances having different values

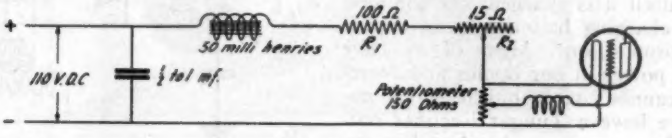


Figure 2—The filter circuit

A "Dry Cell" Vacuum Tube

(Continued from page 29)

machine, and this operation has been refined to a very high degree to make possible such products as are represented in this tube. The final operation in obtaining this tube is performed by the exhaust system. Here special apparatus and special schedules have been developed to make possible a tube of high quality and uniformity.

A characteristic curve for this tube, figure 7, shows that the unusual filament and plate structure and dimensions have in no way produced undesirable variations in this curve. The amplification factor is approximately seven and a plate impedance of about 22,000 ohms is obtained, making it possible to insert this tube in any of the usual circuits designed for a low impedance tube, without fear of unsatisfactory operation.

In operation, the low voltage and power requirements of this tube make certain precautions necessary to the uninitiated user. The filament operates at a low red heat instead of at the bright point to which users of tungsten filament tubes are accustomed. If a six-volt battery were to supply power to this filament with only the usual six ohm rheostat in series, the filament would have a very short life, since the rheostat would not have sufficient resistance to cut down the current to the proper value. At a bright yellow heat this filament will deteriorate rapidly, even though the inexperienced eye may consider it to be operating at a conservative temperature. It is necessary, therefore, until the operator is well acquainted with this tube, that he take special precautions to maintain the filament current at the lowest value, which will give full signal strength. The filament will give no warning, such as a bright light, or noise in the phones, when it is being operated beyond its proper temperature, so that the responsibility for a long filament life lies with the operator in making the proper rheostat adjustments, unless a ballast lamp is used. If this simple rule is followed, the user of this tube will find that he has a new device which will not only make good radio operation more economical, but will enable him to enjoy it with much less attention to the accessories, and in places where he had not thought it possible to carry a set.

Arc Versus Alternator

IN a recent issue of Le Genie Civil an article by A. Bidault des Chaumes discusses the equipment proposed for the high-power station to be erected near Paris.

In the course of the article the author discusses the relative merits of arcs and high-frequency alternators for high-power stations, and in connection with the decision to install high-frequency alternators at the new station, he says:

It now seems certain that the arc systems which have rendered incontestable service in the past will gradually disappear from future installations on account of their numerous inconveniences. This assertion is justified by the following remarks:

In the first place the oscillations set up by the arc are more or less irregular and the useful wave is accompanied by many harmonics which cause interference at receiving stations within a considerable area round the transmitter. Thus the emission from the arc station at the Eiffel Tower possesses many harmonics corresponding to short waves of the order of 300, 600, 1200 meters, etc., in addition to the fundamental wave of 7000 to 10,000 meters wavelength. These harmonics, which are constantly varying, interfere considerably with reception at stations which are accidentally tuned to one or other of these frequencies, even when the receiving stations are as much as 200 km. from the Eiffel Tower.

The arc station at Salonica may also be quoted as a further example. This station uses a normal wavelength of 6,300 meters and a harmonic of 900 meters can be heard at distances of 100 or more kilometers, while it is even detectable at Crete 300 km. from the transmitting station.

The usual process of signaling with arc transmitters consists in slightly varying the wavelength of the oscillations to the extent of from 2 to 3 per cent. in the intervals between the signals. A transmitting station thus radiates two waves with the same power and this fact is particularly harmful at the present time when we are trying to reduce the troubles of receiving stations arising from unwanted transmissions and the multiplicity of communications now necessary. This question will be brought up at the next International Conference and it is practically certain that the suppression of the harmful spacing wave will be rendered obligatory. This suppression, relatively easy in the case of small and medium-power stations, presents considerable difficulty when the power exceeds about 50 kw., while it becomes still more difficult as the power is further increased. In practice no high-power arc at present operates with such a system and the station at Croix d'Hins, which is the most recent high-power arc station uses the compensation wave for signaling.

The decomposition of the hydrocarbon atmosphere round the arc which is indispensable to its operation gives rise to sooty deposits in the interior of the arc chamber, the removal of which necessitates frequent and long cleaning operations, so that it is essential to install at least two arc converters in a normal installation, one being in service while the other is being cleaned. If the service is to be a continuous one a third arc is also necessary as a spare. Thus the power installed in the station is for a commercial service three times that which can be utilized at any time, while further a skilled staff is necessary to carry out the cleaning operations and the replacements of the cathodes, etc.

The irregularities in the arc oscillations give rise to excess voltages which endanger the life of the insulators, while when the compensation wave is used for signaling the insulators are practically always under electrical stress.

The preceding remarks are of a general nature and applicable to all arc stations, but the following refer principally to commercial equipments. Firstly, like the valve transmitter, the efficiency of the arc is low, the maximum theoretically possible being 50 per cent. In practice, the efficiency hardly exceeds 40 per cent. when the arc is carefully adjusted, while if this is not done it falls still lower.

The true overall efficiency is also influenced by the fact that the energy is radiated during the spacing periods, while even if a non-radiating artificial aerial is used for the spacing wave the same energy is still wasted as heat in that circuit.

For the successful handling of commercial traffic high-speed methods of signaling are necessary. The methods of keying usually employed with arc transmitters seriously limit the transmission speed since large and irregular currents must be interrupted. When the power of the installation is greater than about 50 kw. complicated arrangements become necessary involving a multiplication of the number of places where the circuit is broken. Such arrangements prevent the attainment of speeds approaching 100 words per minute such as are possible with other systems. As a matter of fact the large arcs working with America do not transmit at a greater speed than sixty words per minute and even this is not attained without detriment to the quality of the emission. The automatically transmitted signals from the Naval station at Annapolis for example are irregular and often unreadable, while on the other hand those received at the same time from the Radio Corporation's stations at Marion and at New Brunswick, which use high-frequency machines (on less power than used in the arcs at Annapolis), are always clear and regular.—The Radio Review.

The home made receiving set belonging to George Kingsley, Maquoketa, Iowa, consists of honey comb coil tuner, vernier condensers, Radiotron detector tube, three-stage amplifier, Baldwin phones and loud speaker. With this receiver, radiophone concerts, lectures, market reports and church sermons are heard. A list of some of the phone stations heard nearly every night are: Reynolds Radio at Denver, Colo., Radio Corporation, at Roselle Park, N. J., Westinghouse Electric Co., at Pittsburgh, Chicago and Newark, N. J., Oklahoma Radio Shop, Oklahoma City, Western Electric Co., N. Y., Anacostia D. C., and 5ZA, New Mexico.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President* — J. Andrew White, *Acting President* — H. L. Welker, *Secretary*

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HEADQUARTERS: 326 BROADWAY, NEW YORK

FOR the first time the French Government has decided to grant transmitting licenses to French radio amateurs for experimental transmission purposes.

The wave length authorized for these amateur stations is the same as allowed United States amateurs—200 meters. The power is limited to 100 watts in the antenna. Either spark or C. W. transmitters may be used.

Although the French authorities have been slow in giving sanction to amateurs to transmit, they have been liberal, as compared to English regulations, for instance, in the matter of power and wave length, British amateur stations being limited to 180 meters and 10 watts input.

It is reported that the English amateurs are somewhat apprehensive that their French neighbors may now be the first to accomplish Trans-Atlantic transmission from that side.

Δ Δ

KENNETH R. HINMAN, 13, Plainfield, N. J., has invented a wireless receiver that is no bigger than a safety-match box, exclusive of the headphones. With this match-box wireless he can receive from a radius of 30 miles.

Δ Δ

AMATEUR radio operators and boy scouts of Rutherford, N. J., have sent out an alarm for Eddie Wase. His mother is on the verge of a nervous breakdown.

The missing boy left home February 2. Failure in his high school examinations embarrassed him. He is five feet, ten inches tall and looks older because of being well developed.

Δ Δ

AT the annual meeting of the Peekskill, N. Y., Radio Club the following officers were elected for the coming year: Charles R. Doty, president; George I. Olson, vice-president; Charles MacW. Moore, secretary-treasurer.

The club has taken over the hall on the top of the old post office building, formerly occupied by the Beaver Lodge, as their club rooms. They will take possession this week. Plans are under way for the installation of a wireless set to be used in the club rooms.

Considering the fact that the club did not solicit for members until October, the officers expressed great pleasure at the progress of the club which consists of thirty-two members. Anyone interested in the Peekskill Radio Club is asked to communicate with Secretary C. W. Moore, 934 Liberty street.

Δ Δ

DURING January the signals of 5UU were worked five nights in succession by 2BAK. 2BAK's New Year's Eve concert was heard by 1BMV, 3BVD, 8YAC and 9XX. 9XX states that he had ten sets of receivers in series and that every word was understood on detector and one step, using honeycombs.

Δ Δ

KORBER wireless station at the University of New Mexico, Albuquerque, N. Mex., is now in commission and communication has been established with several radio stations, the one farthest away being at the agricultural college at Las Cruces. The station operates on a 375 meter wavelength. The government call is 5YG.

Δ Δ

THE development and present status of long-distance radio communication and problems pertaining to it were discussed at Franklin Institute, Philadelphia, on February 2, by L. W. Austin, Ph.D., head of the United States Naval Radio Research Laboratory, Bureau of Standards, in Washington.

Dr. Austin presented facts regarding the principal high-power stations of the world, and told of contemplated plans to extend communication by radio.

Δ Δ

WILLARD TAYLOR has been elected president of the Syracuse Amateur Radio Association, to succeed Robert Moore.

P. H. Winchester and William O'Brien were elected vice-president. Andrew Potter, secretary, and Richard Hallenback, corresponding secretary, were re-elected.

The association discussed the advisability of a more general use of the continuous wave radio sets. A committee is arranging for the second annual banquet in March.

Δ Δ

THE Arlington Radio Club, Arlington, Mass., has been granted a station license, 1COD, and is operating a telephone transmitter.

Δ Δ

THE Chelsea Radio Association, an amateur organization, holds its regular weekly meetings at the Hudson Guild Club, No. 436 West 27th street, New York City, every Thursday evening at 8 o'clock. An invitation is extended to all radio enthusiasts to attend these meetings.

Δ Δ

PROF. F. P. DURAND, of the High School of Commerce, Omaha, Neb., addressed the Fontenelle Radio Association on the night of January 24, on "The Development of Radio Transmitters."

Δ Δ

THE Radio Club of Long Island has resolved to reduce interference by violators of the law regulating wavelengths.

The club, whose headquarters are in the laboratory of the Ship Owners' Radio Service, 80 Washington street, New York, begins the activities of the new year with a membership of over forty amateurs. A cordial invitation is extended to all radio men on the northern half of Long Island to join. The club meets every other Tuesday.

As an affiliated member of the Executive Radio Council, the club is planning to put into effect in its district, rules laid down by that body for the betterment of operating conditions. For the further education of its members, it is planned to have a lecturer at each of the meetings.

The club's officers are J. Bruce Ferguson, formerly of Woodside, honorary president; R. H. Fowler, of Flushing, president; Samuel Christie, of College Point, vice-president; William Eckert, of East Elmhurst, Secretary; Edward Fenn, of Manhattan, treasurer; Donald W. Exner, of Bayside, publicity manager, and Lester Browne, of Elmhurst, traffic manager.

Δ Δ

DR. A. F. BANKS, an amateur of San Diego, Calif., is believed to hold a long distance record for low-power wireless transmission, according to a letter from Clifford J. Dow, operator at Wailuki, Maui, 2300 nautical miles from San Diego.

According to Dow's letter, messages sent from Dr. Bank's station on the evenings of December 19 and 20, 1920, were received by him without difficulty, the signals being clearly audible at the island station.

The set is a continuous wave transmitter, using three five-watt vacuum tubes, and an antenna which was only 15 feet above the ground. The transmission wavelength is 200 meters. While many amateurs have sent messages over equal or greater distances than that recorded here, the limited power used by Dr. Banks, undoubtedly establishes a new record.

Δ Δ

THE Hudson City Radio Club, 37-39 Sherman avenue, Jersey City, held its regular meeting on February 7. Mr. May was selected to give the junior members of the club some code practice and Walter Waeger to instruct the class in the theoretical points of radio. Classes for senior and junior members take place at 8 P. M. every Monday, Wednesday and Friday evening. Mr. Wenzel has obtained tickets for the annual convention of the second radio district, which the members expect to attend in a body.

The Hudson City Radio Club was organized last April and was incorporated in August. The official call of the club is 2CBK. The club has a membership of thirty-six. The only requirement for admission is that the applicant must have some sort of a radio set. For information, address all correspondence to the Hudson City Radio Club, Inc., 37-39 Sherman avenue, Jersey City, N. J.

Δ Δ

WIRELESS traffic rules, to apply to all amateur radio operators in the city, were approved recently by the Syracuse Amateur Radio Association.

The rules provide that every transmitting

station must have a government license, which is granted to operators making application.

In regard to sending, the rule is that the air shall be free for all kinds of sending from midnight until 6 P. M. on week days.

From 6 P. M. to 9.45 P. M. sending may be done by spark coil sets only, and from 10.05 to midnight the only sending that may be done is what is called DX work, relaying messages for long distances. No sending may be done from 9.45 to 10.05 because that is the time when government stations are sending out reports, etc.

The Sunday schedule states that the air shall be free from 12 P. M. to 6 A. M. and that DX work shall be done from 6 A. M. to 12 M. From noon until 6 P. M. the air shall be free, and from then on the same schedule shall be observed as on week days. The only exception to these rules is that C.W., or continuous wave sets, 10 watts or under, may send at any time.

The Syracuse Amateur Radio Association has about 100 members, who meet the second and fourth Saturday of each month at their rooms in the store of the Hughes Electrical Corporation. All persons interested in radio work may join. The officers are Robert Moore, president; Robert Winchester, traffic manager; Andrew Potter, secretary, and Richard Hallenback, corresponding secretary.

△ △

MR. ERNEST STIDHAM was elected president of the Peoria, Ill., Radio Club on January 10 at a meeting in the police court rooms, city hall.

Other officers elected were H. Klaus, vice-president; L. T. Bourland, secretary; R. Z. Brown, sergeant-at-arms.

△ △

SATURDAY, January 14, was "Radio Day" on the Union College campus, when all the amateur radio operators within a radius of 50 miles, numbering over one hundred, were guests of the Union College Radio Club at their radio exhibit and inspection tour of the General Electric Company's plant. The guests met at the main entrance of the General Electric at 10.30 A. M., and were taken for an inspection trip of the works, especially building No. 40, the radio building. They were divided into squads of twenty each. At noon the guests were entertained by the company at luncheon at the restaurant on the grounds.

At 1.30 the delegates assembled on the Union College campus and visited the radio exhibit in the College Union under the direction of the Union College Radio Club. Many interesting types of radio apparatus were on display. At 2.30 Dr. Peter I. Wold of the physics department of the college gave a lecture on "Vacuum Tube Operations," giving a demonstration of a crystal of rochelle salt being used as a phonograph tone arm. Following this was an address by C. C. Estey, of Salem, Mass., former organizer of the American Radio League. He outlined the plan and purpose of the Schenectady District Executive Council that was formed.

A banquet was enjoyed in the College Union at 8 o'clock, Ralph Bennett, '21, Union, being toastmaster. Among the after-dinner speakers were W. R. G. Baker, of the General Electric Company, on "Transmission," and A. F. Van Dyke, of the same company, on "Radio Receivers," of which he has made a special study.

The Union College station, whose call is 2XQ, is being highly complimented for sponsoring this move to form a council of the amateur radio operators of the Schenectady community.

△ △

AT the first regular meeting of the Schenectady Radio Association, C. B. Roberts was elected president. The other officers are: L. S. Beebe, first vice-president; James F. Burns and Henry W. Peck, vice-presidents; H. B. Wilson, secretary, and W. S. Borcell, treasurer.

The president appointed a constitutional committee to draw up a code with by-laws, and when ready for adoption, notices will be given broadcast by radio and the press.

At the meeting a card index was made of the operators, tabulating the kind of apparatus known, both those with receiving sets alone, and those equipped to send messages.

△ △

MR. PAUL F. GODLEY will deliver an address on wireless at the High School auditorium, Morristown, N. J., on March 17, at 8 P. M., under the auspices of the Science Club of the school. All interested are invited to attend.

△ △

THE amateur radio station of Robert Doscher, Glen Head, L. I., which was located in a separate small building, was entirely destroyed by fire on the night of February 13. An overheated stove caused the fire, which spread so rapidly that the entire building and contents were destroyed before the arrival of the fire department.

△ △

THE Bonham, Tex., Radio Club has recently installed a new receiving outfit and loud-speaker in its club rooms.

△ △

THE First Annual Radio and Electrical Convention will be remembered by the fifty-two wireless amateurs that attended the exhibit and helpful session at the Y. M. C. A., at Pottsville, Pa., early in January.

The opening business session was impressive and some very important rules and regulations with the formation of a Tri-County Radio Club with headquarters at Pottsville for the purpose of furthering the interest of wireless among the amateurs of Northumberland, Lebanon and Schuylkill counties. The following officers were elected: President, Frank G. Kear, Jr.; vice-president, Harry Franklyn Schoenfelder. Traffic rules and regulations were prepared, read, and adopted.

The exhibition attracted a crowd of enthusiastic boys, parents and general public and the room was a scene of lively interest all afternoon. George Arthur Wallace operated the static machine.

The session on C. W. was led by Frank G. Kear, convention president, who gave with authority many interesting statements that were new to the delegates. The evening show of high frequency phenomena was a success under the supervision of Charles Potts assisted by Leslie W. Shollenberger.

△ △

AMATEURS of Bergen County, N. J., have formed a club known as the Bergen County Radio Club. Meetings are held every other Tuesday evening. The secretary is Lloyd Cole, Westwood, N. J.

△ △

AT a recent meeting of the Cleveland Radio Association a four-round fight took place between "C. W." and "Spark." "Static" was the referee, and was very active during all rounds. It later developed that the fight was a prearranged affair. The president, E. H. Pood, was responsible for the exciting few minutes.

At the close of the meeting all present inspected a display of apparatus for sale by the various radio supply houses of Cleveland.

△ △

AT a meeting of the Radio Association of the University of Vermont recently the following schedule was adopted:

Whereas, a schedule seems imperative for the proper control of radio communications in this city, the following schedule is submitted for your approval:

6 A. M. to 1 P. M., free air.

1 P. M. to 4.30 P. M., local period.

4.30 P. M. to 6 P. M., daylight long distance period.

(Continued on page 45)

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

Best Complete Receiver for picking up the Broadcasting programs.

CLOSING DATE APRIL 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the June, 1922, issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

Reception of the Broadcasting Stations' daily programs is becoming more popular every day. The newcomer wants to know "What is the best kind of apparatus to use?" You tell them, amateurs. It's up to you.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00. *In addition to the regular space rate paid for technical articles.*

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

CALLS HEARD IN HAWAII

Air Service Radio Station XF1, Langley Field, Va. (near Norfolk), which is in the amateur range of wavelengths, and which has been doing quite a bit of amateur relay work, has been heard at Station 6ZAC, in Hawaii, during daylight.

The input of the C. W. set of XF1 is about 500 watts, and the antenna current between 5 and 6 amperes, on 375 meters. The antenna is of the umbrella type, with an elevated counterpoise.

The log of Radio Station 6ZAC, Clifford J. Dow, Wailuku, Hawaii, is interesting, in that it includes reception of signals from a number of U. S. Stations in addition to XF1.

Dec. 26—5.55 pm., 7ZB de 7ZP, "R Nil hr OM. QRK? K"; 5.58 pm., 6AK de 7ZP "Mugs"; 5.58 pm., 7ZV de 7ZU.

Dec. 26—5.15 pm., 7ZJ working 7ZP; 5.25 pm., 7ZP de 7ZJ "QSA OM QSR 2 QRK?" 5.30 pm, 7ZP de 7ZJ; 5.31 pm, 7ZP de 7ZJ; 5.33 pm, 7ZS-4GL-8ZP de XF1 cw; 5.34 pm, 4GL de XF1; 5.36 pm, 4GL de XF1; 5.40 pm, ? ? ? de 5XU (QRM arc); 7.20 pm, 6ZAF de 7ZJ; 7.22 pm, 7ZJ de 6ZAF; 7.23 pm, 6ZAF de 7ZJ; 7.25 pm, 6ZAF sending to 7ZJ; 7.26 pm, 7ZJ de 6ZAF; 7.32 pm, 5QA de 6ZB; 7.37 pm, 6ZX de 6ZAF; 8.05 pm, 6AIF de 5QA; 8.06 pm, 6AIF de 5QA; 8.07 pm, 6AIF de 5QA.

1XE, Irving Vermilya, Marion, Mass. (January).

(1BIU), (1BQE), 1AW, (1AEV), (1AFV), (1BAS), (1BIR), (1BES), (1CLI), (1AZW), (1CIT), (1AKB), (1BCF), (1BKR), (1BKQ), (1BDI), (1BEA), (1BJW), (1CDR), (1CDP), (1BQA), (1ARY), 1CK, 1TS, 1BDT, 1UN, 1FB, 1XE, (2ZL), (2AAB), (2VA), 2FQ, 2AN, (2WP), 2BRC, (2BML), (2AWF), (2FP), (2AJW), (2OM), (2BK), 2NZ, 2AAC, 2AGB, 2XQ, (3HJ), (3AUF), (3FS), (3FM), 3XL, (3LK), (3CC), (3CN), (3ZO), 3ZE, (4BY), 4CB, 5ZA, 8NI, (8AWP), (8BRL), (8KH), (8JS), 8LX, 8AGZ, (8JL), 8JE, 8DE, (8ZG), (8BUM), (8IL), 9ZN, 9VV, 9ZJ, 9AAW, (3BP) Canadian, WDY, WJZ, KDKA, WBZ, DF1, AN5.

2OM, F. B. Ostman, 180 Broad St., Ridgewood, N. J. (January).

1AFZ, (1AMD), (1APO), 1ARO, (1ARY), (1ASF), (1AW), (1AZK), 1BCF, (1BDT), (1BDV), 1BJE, 1BOE, 1BQA, 1BQL, (1BVB), 1BVH, 1BWY, (1CC), 1CHJ, (1CK), (1CM), (1CNI), (1CP), (1CZ), (1DY), (1DZ), (1EV), (1FM), (1GM), (1HK), (1LZ), (1OE), 1ON, (1RV), (1SN), (1WQ), 1YB, 1YD, 2ANM, (2AWF), 2BY, (2GK), (2OO), (2PV), (2SZ) Canadian, (3BP), (3EI), (3GE), (3GN), 3KG, 3ABB, (3AC), (3ACE), (3AHF), (3AHK), 3AHQ, (3AJD), 3AK, (3ALN), (3AQR), (3ARM), (3ARN), 3ASH, (3ATZ), (3AUW), (3BFU), 3BJM, 3BJP, (3CC), (3CG), (3CI), 3CX, 3DM, 3DN, 3FB, 3FP, 3GM, 3HB, (3HG), (3HJ), (3JL), (3KM), (3LP), 3NB, (3OU), 3PB, 3PU, 3QD, 3QF, (3QN), (3TA), (3UC), (3UD), (3UQ), 3US, 3UX, (3VW), 3XC, 3XF, (3XM), 3YV, (3ZA), 3ZF, (3ZZ), (4AG), 4BC, 4BG, 4BI, 4BQ, (4BX), (4CX), 4DC, 4DH, (4EA), 4FD, 4GN, (4XC), 5DA, 5EA, 5ER, 5EK, 5FJ, (5FV), 5HK, 5IR, 5JD, (5PY), (5XA), 5XK, 5ZL, 5ZAF, 8AAV, (8ACQ), (8ADE), (8AFA), 8AFB, (8AFD), (8AFG), 8AHK, (8AHH), (8AHS), 8AHY, 8AID, (8AJT), (8AJW), (8AKQ), (8AMB), (8AMZ), (8ANO), 8ANV, 8ANW, 8APB, 8AQP, (8AQV), (8ARD), (8AVO), (8AVT), (8AXN), 8AXO, 8AXY, (8AYN), (8BBO), (8BBU), 8BBY, 8BCK, 8BDK, (8BDY), 8BEP, 8BGT, 8BHV, (8BO), (8BRL), 8BSY, 8BUN, (8BUM), 8BWI, (8BXC), (8BYM), (8BYP), (8CAY), 8CEB, 8CEJ, 8CG, (8CP), 8CQ, (8DY), (8EA), (8EB), (8EW), 8FI, (8FT), 8HG, (8HR), 8ID, (8IN), (8JJ), 8KH, 8KK, 8KU, (8KY), (8LH), 8LI, (8MZ), 8NO, 8NZ, 8PE, 8PL, 8QC, 8QQ, (8SP), 8TJ, 8TK, (8TT), 8TY, 8UC, (8UP), 8UH, 8VL, (8VW), (8WD), (8WE), (8WO), 8WZ, (8XE), 8YAA, 8YM, 8YN, (8ZAC), (9AAW), 9AAY, 9ABV, 9ACB, 9ACL, (9ACY), 9ACZ, 9AEK, 9AFF, 9AFK, 9AFP, 9AFX, 9AGR, 9AIF, 9AIG, (9AIR), 9ALP, 9ALS, 9AMG, 9AOE, 9AOJ, (9APS), (9APK), 9AQV, (9ARG), 9AR, 9ARY, 9ASK, (9ASN), (9AU), 9AV, 9AWU, 9AWX, (9AWZ), 9AYH, 9AZA, (9AZE), (9BP), 9DBW, 9DCX, 9DEH, 9DHZ, 9DIW, (9DKV), (9DLX), 9DMJ, 9DPH, 9DQY, 9DRJ, 9DSO, (9DUG), 9DWJ, (9DWP), 9DXM, 9DYU, 9DZI, 9DZY, (9CP), 9FS, 9GN, 9HM, 9HR, (9JQ), 9LF, 9LZ, 9ME, 9OU, (9OX), (9PS), 9QH, (9TL), (9UH), (9UU), 9VL, 9WZ, (9WT), 9ZY,

C. W.—1ADI, 1ADR, (1AFV), 1AIP, 1AMQ, (1AMS), 1ANO, 1ARY, (1AVI), (1AVR), (1AWB), 1AXD, (1AZW), (1BDI) (1BEA), 1BES, (1BKQ), 1BIR, (1BWJ), 1BWY, (1CAK), 1CIV, 1COA, (1ES), (1GV), 1QN, (1RD), (1RZ), 1TS, (1XM), (1XX), (1ZE), (2XQ), 3AAD, 3ADT, 3AQH, (3AQR), 3ARD, (3BEC), 3BLF, 3BQ, 3BZ, (3CC), (3CQ), (3DH), (3EM), 3FS, 3GH, 3HG, 3HJ, 3HQ, 3IE, 3KS, (3KM), (3MO), 3NJ, 3QV, (3RF), 3RW, 3YP, 3ZO, 3ZY, 4BQ, (4BY), 4DC, 4FT, 4GL, 4GX, 4HW, 4II, 4ID, 4ZE, 5DA, 5EK, 5FV, (5UU), 8ADG, 8AGO, (8AGZ), 8AIO, 8AKJ, 8AKP, 8ALB, 8AMD, 8APW, (8AQV), 8AQF, 8ARU, 8AVO, (8AWP), (8AWY), 8BA, (8BEF), 8BEX, (8BFX), 8BJV, 8BK, 8BO, 8BOX, 8BRL, (8BUM), (8BWK), 8BZC, 8BZY, 8CGT, 8GV, (8HJ), 8IH, (8II), 8IQ, (8IV), 8JL, (8JQ), (8JS), 8LJ, (8LX), 8NB, (8NI), (8QM), 8RQ, (8SP), 8UO, 8VT, 8XH, 8XV, 9AAS, 9AAY, 9AJA, 9AJH, 9AKD, 9AKR, 9BAP, 9BIG, 9DWJ, 9EI, 9GK, 9IL, 9NX, 9PG, (9UC), 9ZB, (NZO), (XFI), (X4L).

2BAK, Joseph B. Slavin, Old Post Road Garage, Tarrytown, N. Y. (February).

C. W.—1QN, 1RZ, 1ZE, 1BEA, 3BG, 3BZ, 3CC, 3FS, 3GB, 3HG, 3HJ, 3HX, 3KM, 3RF, 3RW, 3YP, 3ZN, 3ZO, 3ZY, (3XM), 3AAE, 3ADT, (3AQR), 3ASV, 3BKA, 3BLF, (4BY), 4CO, 4FT, 4GL, 4ID, 4ZE, 4ZL, 5AN, 5BJ, (5FV), (5UU), 8BK, 8DR, 8TL, 8JW, 8LX, 8SP, 8XV, 8ZR, (8ZV), 8AGO, 8AGZ, 8AHH, 8AJY, 8AKQ, 8AQF, 8ARW, 8ASB, 8AUO, 8AWP, (8BEX), (8BFX), (8BOX), 8BRC, 8BTP, 8BUM, 8BUN, 8CFP, 8EXI, 9AT, (9PG), 9NX, 9TJ, 9AAS, 9AAV, 9AJA, 9AJH, (9BED), DF1, NOF-phone, NMW, KDKA-phone, WBZ-phone, WYCB, XF1.

2NE, A. H. SAXTON, Jersey City, N. J. (January). On a single tube.

C. W.—Canadian 3BP, 1AFV, 1AIP, 1AJP, 1AKB, 1AKC, 1ARY, 1AWB, 1AXD, 1AYL, 1AZW, 1BCF, 1BDI, 1BDW, 1BEA, 1BES, 1BKK, 1BKQ, 1BKR, 1BSD, 1BSM, 1BWJ, 1BYK, 1CAK, 1CDR, 1CGS, 1CHW, 1CJH, 1FF, 1QG, 1QN, 1TS, 1UN, 1XJ, 1XM, 1XX, 1ZE, 2AJP, 2XQ, 3ADT, 3AHK, 3BA, 3BC, 3BEC, 3BLF, 3FS, 3HG, 3HJ, 3MO, 3RW, 3YP, 3ZO, 3ZY, 4BQ, 4BY, 4CO, 4EL, 4FT, 4GL, 5UU, 8ADG, 8ADR, 8AGL, 8AGO, 8AGZ, 8AHR, 8AIF, 8AIL, 8AIO, 8AMK, 8AQP, 8AQO, 8AWP, 8AXB, 8AXC, 8BBK, 8BFX, 8BEF, 8BK, 8BO, 8BOW, 8BOX, 8BRL, 8BUM, 8BXH, 8CEH, 8EA, 8EB, 8IQ, 8IV, 8JL, 8JQ, 8JS, 8KH, 8KO, 8NI, 8QB, 8SP, 8UK, 8VJ, 8VY, 8WA, 8WR, 8WY, 8XK, 8XV, 8ZAE, 8ZN, 8ZV, 9AAV, 9AJA, 9AJU, 9ASH, 9BBF, 9BED, 9DV, 9DWJ, 9HW, 9NX, 9PG, 9ZB.

Spark—Canadian 3BP, 1ALK, 1APO, 1ARY, 1AW, 1AZK, 1BCF, 1BDT, 1BHR, 1BOE, 1BQA, 1BRW, 1BVB, 1CHJ, 1CNI, 1CP, 1FM, 1GM, 1HK, 1LZ, 1MA, 1OE, 1OJ, 1ON, 1RV, 1SN, 1WQ, 1XP, 1YB, 1YD, 2AIJ, 2AJP, 2ANM, 2BY, 2GK, 2SZ, 2XQ, 3AC, 3BFU, 3GN, 3KG, 3LI, 3ME, 8AHH, 8AHS, 8AIB, 8AMB, 8AMZ, 8APB, 8ARD, 8AXO, 8AXY, 8AYF, 8AYN, 8BUM, 8BYP, 8FT, 8JJ, 8KY, 8MZ, 8NZ, 8PL, 8UC, 8VW, 8WE, 8XE, 8YN, 8ZAC, 8ZP, 9AAW, 9ALE, 9ALS, 9AMQ, 9AOE, 9APK, 9AR, 9AU, 9AWG, 9AWZ, 9AZE, 9BP, 9CP, 9DKV, 9DLX, 9DQO, 9DSO, 9DWP, 9DY, 9DYU, 9LF, 9OX, 9QH, 9SP, 9UH, 9UU, 9ZJ.

(Continued on page 46)

Distance Records

WHEN signals from a radio station are heard at unusual distances it is proof that the station is an efficient radiator of energy. The location, apparatus, construction and operation of an efficient station is therefore, of great interest to all amateurs, and THE WIRELESS AGE wants this information.

You are therefore requested to send us a monthly list of distant amateur stations heard, which will be published regularly. Report only stations located 200 miles or more distant from your station. Arrange the calls by districts in numerical order.

State whether the stations heard use a spark or C. W. transmitter. THE WIRELESS AGE will follow the records closely and whenever possible will secure and print illustrated articles on the stations consistently heard over long distances, for your benefit and the benefit of amateurs.

If a station is an efficient radiator of energy, it should be given proper credit in the history of amateur progress, and at the same time you will be given credit for efficiency in receiving in having heard it, as your name, address and call letters will be published with all lists submitted by you.—THE EDITOR.

American Stations Heard by English Amateurs

(*Continued from page 25*)

The antenna used by Mr. Corsham consisted of a single wire, 100 feet long, in the form of an inverted L. Two masts were used, one 20 feet high in a garden, and the other secured to the chimney of the house, the maximum height above ground being 46 feet. The lead-in was taken from the highest point of the antenna. As the receiving instruments were located in a room 20 feet above ground, the free end of the antenna was practically on a level with the receiving instruments. A double earth connection was used, consisting of a single wire running under the antenna wire and grounded at the far end, and a connection was also made to the water piping. Three tubes including a separate oscillator, were used by Mr. Corsham during the test.

The antenna used by Mr. Spence, whose address is Huntley, Aberdeenshire, consisted of a single copper wire 45 feet average height above ground, length of horizontal part 80 feet, with down-lead of 20 feet to instrument room, the latter situated 25 feet above ground. Earth connection was made to the water piping and also to a wire running under the antenna and earthed at the far end. Six tubes were used by Mr. Spence, who states that his station is situated in the middle of a forest, and is particularly badly screened toward the west by sharply rising ground, and also by trees, which are higher than his antenna.

N. A. W. A.

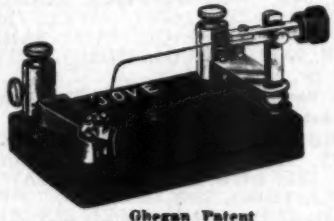
(*Continued from page 43*)

6 P. M. to 7.30 P. M., local period.
7.30 P. M. to 9 P. M., standby for concerts.
9 P. M. to 6 A. M., long distance period.
Subject to change in case of special tests and relays. Δ Δ

MUNROE COX (1CJR), Swampscott, Mass., won the first prize in the Amrad Variometer Name Contest recently concluded. Amrad Basketball Variometer is the name selected by the Committee of Award, and it will be used hereafter in the company's advertising.

Raymond R. Howe, West Lafayette, Ind., with "Minimax," and Wendell J. Reed (1BYL), of Auburndale, Mass., with "XE-lent" were awarded second and third prizes, respectively. All three prize winners are licensed amateurs. Mr. Cox received two Basketball Variometers and one Basketball Vario-Coupler. The second and third prizes were, respectively, one Basketball Vario-Coupler and one Basketball Variometer.

(*Continued on page 47*)



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Sample mailed for $2.00 **Tested and Guaranteed Galena, 25 Cents**

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ARKAY LOUD SPEAKER **Radio Horn**

Black	$5.00
Nickel finish.....	6.00
Metal Dials with vario coupler-grid aerial plate variometer engraved on German Silver dial. Price vario coupler 3½ inch dial	1.25
Grid and plate variometer 4 inch diameter	1.40
We carry all other makes of dials and arms	
Bakelite panels, 1/8 inch, 3/16 inch, and 1/4 inch thickness, cut and polished to your dimensions ..... *Per Pound*	2.25

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PACENT UNIVERSAL PLUG

This is a radio plug. It fits all standard jacks—and pocketbooks. Of course, no solder is used to make a connection with the Pacent plug. The cord tips are held in such a way that pulling—up to and beyond the breaking of the cord—only tightens the grip. Yet the tips may be released instantly by proper manipulation of the springy strips. A soft, velvety black finish with polished metal parts makes the Pacent plug easy to look at; it is truly beautiful. Rugged construction makes the device good for a lifetime. There is only one Pacent Plug and that is approved by the United States Government and used by the foremost amateurs. Don't forget to insist upon the original, 100 % plug.

FROM YOUR DEALER OR DIRECT - $2.00

You should have a copy of our booklet PW entitled "*Pacent Radio Essentials*" which will be sent you on receipt of five cents in stamps.

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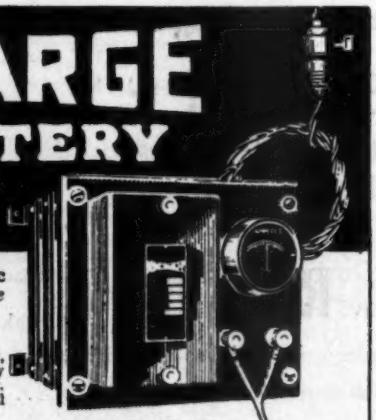
HOMCHARGE
YOUR BATTERY
for A Nickle



A perfect rectifier at last, fully automatic and foolproof in every respect. *It can be operated by anyone.*

THE HOMCHARGER

connects to any alternating current socket, gives a taper charge—will fully charge any "A" battery over night. It is self-polarizing. Connect your battery either way and it will always charge.

Automatically disconnects battery when power is interrupted. Restarts charging when connections are restored. Adjustable for wave form, frequency and voltage. Contains only one moving and two wearing parts, lasting thousands of hours, replaceable as a unit for $1.00.

The highest charging rate, greatest efficiency, and simplest of any rectifier selling for less than $100.00. Bulletin 628 proves it. Ask for your copy.

Manufactured in sizes for charging three or six-cell batteries from both alternating and direct current circuits. Cannot injure battery—will last a lifetime—approved by underwriters—satisfaction guaranteed. For sale by all Radio, electrical and accessory dealers or shipped express prepaid for purchase

Price $18.50

ATTENTION, MOTORISTS!

The AUTOMATIC ELECTRICAL DEVICES CO.
119 West Third St., Cincinnati, Ohio
Canadian Distributors—Rowley & Moody, Ltd., Toronto.

(*Continued from page 44*)

8AP, J. MARTIN SIMONS, Philadelphia, Pa. (January)

Spark.—1AW, 1HK, 1QA, 1BVB, 1ASF, 2DK, 2DN, 2TF, 2TS, 3IW, 3ASC, 3AQR, 8WO, 8BVA, 8FT, 9CP, 9AAW, 9AGR, 9AWX, 9DBE, 3BP, 3JL Canadian.

C. W.—1PE, 1AFV, 2AWL, 2AAX, 2AYZ, 3EM, 3ZO-phone and cw, 4GL-phone, 8II, 8JQ, 8BUM, XF1.

6TV, CHARLES C. WHYSALL, Los Gatos, Calif. (January).

5BY, 5EW, 5FA, 5FO, 5HK, 5IR, 5IS, (5IF), 5LB, 5MF, 5MK, 5NS, 5OF, 5TU, 5UG, 5XB, 5XJ, 5XU, 5YI, 5YQ, (5ZA), 5ZAF, 5ZAM, 5ZZ,(6AHQ), 6ACY, 6AHA, 6ADL, 6AMK, 6ADA, 6AEH, (6AMN), 6AIB, 6AVB, (6AAU), 6AFN, (6ASV), (6AAH),(6ALU), (6AKL), 6ALV, 6ALE, 6ACR, (6AHA), 6ATG cw, 6ALD, 6ABW, 6AGF, 6AVR, (6ATH), 6AKW, (6AFP), (6AWX), 6ANG, 6AGP, (6AK), 6AS, 6AH, 6BCA, 6BGH, 6CU, (6EN), (6EX), (6EA), 6FH, (6FT), (6GT), (6GP), (6GD cw), (6IV), 6IS, 6JD, (6KS), 6KH, 6KA cw and spk., (6KC), 6KY cw, 6KM, KWG, (6MH), (6MZ), 6NG, (6OD), (6OH), 6OL, (6PJ), 6PS, (6PR), 6QK, (6RS), (6TO), (6TU), 6TF, 6UO,(6VX), 6VK, 6VZ, (6XH cw and spk.), 6XAD cw, (6ZAM), (6ZX), (6ZZ), (6ZR), 7BK, 7FI, 7YA, 7ZO, 9AQE, 9AEG, 9AMB, 9AYS, 9ALU, (9DUG), (9DSD), 9DTH, 9NX cw, 9XAQ.

8WO, Harold I. Brainard, 836 Richmond Ave., Buffalo, N. Y. (January).

(1ABB), (1ASF), 1ARY, 1AW, (1AZK), 1BDT, 1BGF, (1DY), (1RV), (1SN), 1YD, 1ZE, 2AIM, 2ALY,(2ARB), 2AWP, (2BK), (2DK), 2DN, 2EL, 2FD, (2FP), (2HJ), (2JU), (2OM), (2PL), 2TS, 2UE, (3AHK), (3AQR),(3ARM), 3BG,(3CA), 3CC, (3CG), 3DH, 3IW, 3KM, 3NB, (3QN), (3VW), 3XF, (3HG), (3HJ), (3ZA), (3ZM), (4EA), 4AG, 4BQ, 4CQ, (4CX), 4DH, 4EY, 5FV, 5HK, 5JD, 5SM, 5ZA, 5XA, 5ZL, 5ZZ, (8AQV), (8ARD), (8AFD), (8AFB), (8AFG), (8AJT), (8AKP), (8AKW), (8ARG), (8ARS), (8AUY), (8AVT), (8AYS), (8AYN), (8BA), (8BAH), (8BFH), (8BRL), 8DR, (8DY), (8EA), (8EF), (8EW), 8EZ, (8FI), 8FT, 8HG, (8HY), (8IN), 8JJ, (8MJ), 8NO, 8OI, 8RQ, 8SP, (8TJ), (8UC), (8YL), (8WE), (8WD), (8WZ), (8YAA), (8ZAC), 8ZW, 9AAJ, 9AAP, 9AAW, 9ACB, (9AGR),(9ATN),(9AVE), (9AKR), (9CP), (9DKQ), (8AWP), 8BRL, (8HJ), (8II), 8SP, 8XX, 8XK, 8ZG, 9AIG, (9DWJ), (9DKV), (9DNC), 9DXM, 9DYN, (9GP), (9HR), 9HM, (9HT), (9JN), (9ME), 9MC, 9PC, 9PS, (9TL), (9TZ), (9UH), (9UG), (9VK), (9WT), (9WI), 9ZN, Canadian (3BP), (3EI), (3FQ), (3GE), (3JL), 3QJ, 8SE.

C. W.—(NOF), NZO, 1ARY, 1AJP, 1BCG, 1UN. (1XM), 1ZE, 2AWL, (2EH), (2KL), (2XQ), 2XX, 3AHK-phone, VY, QSA, 3ZO, 4BQ, 4GL, 5AN, 5FV.

8CP. Orie Palmer, Holland, Mich., (January).

(2ARB), 2ARM, 2BFU, (2BM), 2BK, 2EL, (2FP), (2JU), 2OM, 2PU, 3AJD, 3BK, (3FB), 4CG, 4CX, 4DH, 4BQ, 4GN, 5BY, 5ER, (5FO), 5HK, 5IQ, 5IS, 5PG, 5TU, 5ZA, 5ZL, 8AAP, 8ACF, (8ACO), (8AFA), (8AFB), 8AFG, (8AIE), 8AIZ, (8AJK), (8AKQ), 8AKV, (8AMZ), 8ANO, 8AOG, 8ARD, 8ARS, 8ATU, (8AUM), (8AUV), (8AVE), (8AVT), (8AXN), 8AXO, 8AYN,(8BAZ),(8BBU), (8BCY), 8BEP,(8BEN), 8BHV,(8BLW), (8BUM),(8BTL), 8BWD,(8BXC), 8BXX, (8ZAA), 8ZAC, 8BA, 8CH, (8EB), 8EF, 8EW, 8FI, 8FT, (8JP), (8II), (8NZ), 8OI, 8QQ, (8SP), (8UC), (8YN), (8VY), (8XE), (8WD), 9AAP, 9AAW, 9ACB, (9ACL), (9AEF), 9AEZ, 9AFF, (9AGR), (9AGN), 9AIF, 9AIR, (9AIU), (9AJH), (9ALP), (9ALU), 9AMK, 9AMQ, (9ANO), (9AOH), (9AOJ), 9APR,

(9ARZ), (9ASJ), (9ASK), (9AUH), 9AUL, 9AVP, (9AWZ), 9AYH, 9AZA, (9AZE), (9BDS), (9BIJ), (9DAZ), (9DBU), (9DCW), 9DHD, (9DHZ), (9DKQ), (9DKV), (9DLX), 9DLD, 9DMM, 9DQQ, (9DRA), 9DSD, 9DTN, 9DYU, 9DVW, 9DXM, 9DXW, 9DVY, 9DZE, 9DZI, 9DZK, 9AF, 9AR, 9AU, 9AK, 9BP, 9BF, (9CP), (9FS), 9FU, (9GN), (9GX), 9HM, (9IB), 9IZ, 9JN, 9JV, 9LF, 9MC, 9ME, (9MS), 9MQ, 9NQ, 9OA, (9OX), (9OU), 9OR, (9PD), 9PI, 9PJ, (9RC), (9TO), 9TI, 9TL, (9UH), (9UU), (9VL), 9VV, 9WI, 9XI, 9YQ, 9ZN, (Can. 3GN).

2BDB, Joe Hill, 1572 Va. St., Charlestown, W. Va. (January).

C. W.—1AFV, 1ANQ, 1ARY, 1AYL, 1AZW, 1BCG, 1BDI, 1BEA, 1BIQ, 1BIR, 1BKQ, 1CGS, 1DF, 1IV, 1QN, 1UN, 1ZE, (2AAB), (2AJW), 2AJF, 2AWF, 2AWL, 2AYV, 2BAK, 2BAY, 2BFZ, 2BGH, (2BNZ), (2BRG), 2BYG, 2FD, 2QF, 2VA, 2WP, 2ZV, 3AAJ, 3AAO, 3AAY, 3AFU, 3AGK, 3AHK, (3AJD), (3ALO), 3AQR, 3BA, 3BHL, (3BIJ), 3BKX, 3FS, 3GH, (3HG), 3KM, 3OQ, 3RQ, 3ZN, 3ZO, 3ZY, 3BZ, 3SQ, 4BK, 4BT, 4BY, 4CG, 4CO, 4CY, 4EB, 4EH, 4EL, 4EO, 4GX, 4GL, 4ID, 4ZF, 5UU, 5FV, 5AN, 5DA, 5KU, 5AZ, 5EK, 5XN, 5ZX, 6PD, (8AIO), (8AQV), (8AWZ), (8BEF), (8BHX), (8IQ), (8WY), 9AAY, 9AIH, 9ARK, 9BLO, 9BBF, 9BED, 9BIQ, 9DDU, 9DKP, 9DPE, 9DIG, 9DWJ, 9KR, 9SJ, 9LE, 9UK.

N. A. W. A.

(Continued from page 45)

THE Sisterhood of the Temple Beth Elohim is holding a bazaar on March 25, 26, 27 and 28, afternoons and evenings, at the Temple Building, 812 Faile street, Bronx, New York City. One of the features will be a radio exhibit, call letters 2BEC.

△ △

AT a recent meeting of the Irvington, N. J., Radio Club, the officers for the year of 1922 were elected: President, Herman Enderwood; first vice-president, Edward Heim; second vice-president, Herman Fisher; corresponding secretary, H. A. Wien; recording secretary, C. Rassnagle; treasurer, Alfred Oechler; representatives to the Second District Radio Council, Edward Heim and Alfred C. Mills.

△ △

THE call 1FM has been assigned to the Portland Y. M. C. A., Portland, Me. All communications in reference to the work of this station should be addressed to Radio operator, Y. M. C. A., Portland, Me.

△ △

MR. JOHN M. FORSHAY has been appointed district manager of the New York office of the Jewell Electric Instrument Co.

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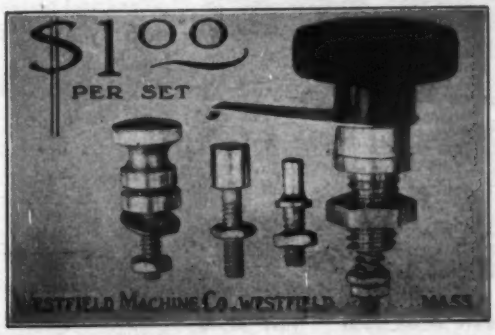

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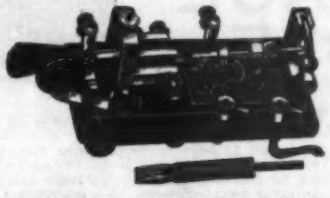

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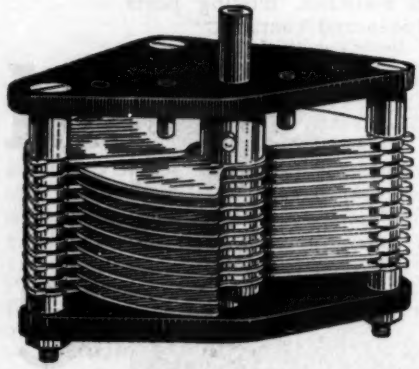

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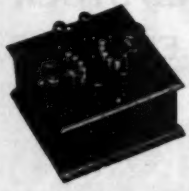

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Queries Answered

ANSWERS will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

H. C. J., Mt. Vernon, N. Y.

Q. 1. I wish to wind an electro-magnet two inches in length on a core one-quarter of an inch in diameter to operate on a six to ten-volt current.

Would you be kind enough to tell me the proper gauge wire and the number of layers or turns of wire to use in order to get the greatest magnetic strength?

Ans. 1. Your requirements are rather vague as you state that you wish to obtain the greatest possible magnetic strength. You further do not state the number of amperes which you wish to use.

The number of turns of wire and the number of amperes of current determines the magnetic strength.

Would suggest that you wind your magnet with No. 22 magnet wire and about 10 layers deep, the full length of the core.

J. C. S., Salt Lake City, Utah.

Q. 1. Will you please publish the diagrams of the following circuits mentioned in the article entitled, "Ten Tube Receiving and Transmitting Set," in the January Age?

1. Tube
2. Ultraudion
3. Variometer Regenerative
4. Tickler Feed Back
5. Double Coil Primary

Or if these circuits have been published within the past years in THE WIRELESS AGE will you give me references?

To a beginner these terms are somewhat confusing. I thank you.

Ans. 1. The diagrams requested by you have been published from time to time in this magazine, but I suggest you procure a copy of the "Wireless Experimenter's Manual," by E. E. Bucher, from the Wireless Press, 326 Broadway, New York.

P. B. A., Reykjavik, Iceland.

Q. 1. Please give dimensions for a fixed condenser of .002 mfd. using mica as dielectric, to stand 1,500 volts. Give size of plates and thickness of mica in Cm. and Mm.

Ans. 1. A single sheet of high grade mica 3 inches by 4 inches by .002 inch will give a capacity of .004 mfd. and will withstand 1,000 volts, so we would recommend mica sheets 4 inches by 5 inches by .004 inches with conducting material 3 inches by 4 inches, and this will mean four of these condensers connected in parallel. If you cannot obtain mica .004 inches thick you can use two sheets of mica .002 inches thick laid one on top of the other.

Q. 2. How many volts would a paper condenser stand, if paper were soaked in paraffine?

Ans. 2. Approximately 100 volts, depending upon the grade of paraffine.

Q. 3. With what results could the new Radiotron UV-200 and UV-201 be used in connection with a De Forest Amplifier Type P 2 No. 65 and Type P-300?

Ans. 3. Good results.

Q. 4. Would the new transformers manufactured by R. C. UV-712 give much better results?

Ans. 4. Yes, as they are designed to work with the UV-201 tube.